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Environmental Protection in Finland

National Report 1987

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Ministry of the Environment
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Department

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Rapporten ger helhetsbild av Finlands miljöpolitik och realiseringen av den. I kapitlen I-II beskrivs Finlands naturförhållanden och andvändningen av naturresurserna samt förvaltning och finansiering.

Kapitlen III-IV tar upp förverkligandet av miljöpolitiken, miljölagstiftningen och -förvaltningen, finansiering av miljövården samt miljöforskning, monitoring och miljökonsekvensbeskrivning.

Kapitlen VI-VIII behandlar åtgärder inom olika sektorer av miljövården och kapitel IX internationelt sammarbet.

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1 PREFACE

In 1986-87 the Environment Committee of the Organisation for Economic Co-operation and Development (OECD) carried out a Review of Environmental Policies in Finland. As a background document for the Review a publication called "Environmental Policies in Finland, National Report" was published in July 1987 by the Ministry of the Environment. The preparation of that Report took place in an ad hoc Working Group composed of experts representing different fields of administration and of environmental policy.

As environmental policies have developed fairly rapidly much of the information contained in the earlier Report has already proved to be out-of-date. It was therefore considered necessary to produce a new edition now titled" Environmental Protection in Finland". This new edition has thus been prepared by updating and rewriting the earlier Report. Much work was, again, done by the members of the above mentioned ad hoc Working Group as well as many other experts in different fields of environmental policy.

The quality and contents of this Report have been of decisive importance for the Review on the Environmental Policies of Finland carried out by the OECD Environment Committee through the OECD Secretariat and experts from the OECD Member Countries. I would therefore like to express my most sincere gratitude to all those who have prepared the texts for this Report, and contributed to their editing and publishing. Your efforts have been most valuable for the Review which, to my understanding, has been successful both from our viewpoint and from the view of the OECD.

I would like to underline that this Report has been produced in co-operation with many other public authorities as well as non-governmental organisations. I would like to mention at least some of them, i.e. the Ministry of Agriculture and Forestry, the Ministry of Trade and Industry, the National Board of Waters and the Environment, the National Board of Taxation, the Central Statistical Office of Finland, the Confederation of Finnish Industries and the Finnish Nature Conservation Association.

The editor and leading author of this Report has been Ms. Eeva-Liisa Hallanaro assisted by, among others, Ms. Tuire Lohse. The work has been conducted by Dr. Olli Ojala.

Kaj Bärlund
Minister of the Environment

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I BACKGROUND

2 BACKGROUND INFORMATION ON FINLAND

2.1 Nature and natural resources

2.1.1 Geography and climate

Finland is situated between the latitudes 60° and 70° N. With a total area of 338,145 km^2 it is the fifth largest country in Europe. One quarter of the country lies north of the Arctic Circle and, on the basis of its medium latitude (64°47'50"), it is together with Iceland the northernmost country of the world. Finland is bounded in the west and south by the Baltic Sea (the Gulf of Bothnia and the Gulf of Finland). The coastline, which is about 1000 km long, is for the most part dotted with islands, there being over 20,000 of them altogether. Most of the islands are located in the southwestern archipelago, which merges into the Åland islands in the west.

Most of the country is lowland, falling gradually to the south and southwest. The average height above sea level is 152 m. The only extensive highland area is the north-west tip of the country, joining the Scandinavian keel.

Finland's climate is milder than that of many other areas at the same latitudes. This is mainly due to the moderating effect of the Gulf Stream. Heat is stored in the waters of the Baltic and its bays, and the inland lakes, swamps and forests also help to make the winters milder. The mean temperature may exceed 20°C in the warmest summer months in southern Finland, but the long-term average is between 13° and 17°C for July and between -3° and -4°C for February. The growing season (>+5 °C) is rather short: 175-180 days on the south coast and about 130 days at the Arctic Circle. The long summer days, however, help to make up for the short season.

The yearly mean precipitation is about 700 mm in Southern Finland and under 500 mm in Northern Finland; 30-40% of the precipitation falls as snow. The ground is snow-covered for about three months a year in the south and for as much as seven months in the north. The average thickness of the snow-cover varies accordingly between 20 and 80 cm. The lakes are ice-covered from November to April or May, or even June in the northernmost parts of the country. The mean relative humidity is approximately 80%. The prevailing winds are south-westerly.

2.1.2 Bedrock and soil

The bulk of Finland's bedrock belongs to the broad Precambrian area known as the Fennoscandian shield, which stretches throughout northern and eastern Europe from the mountains of Scandinavia to the south of Russia. It is one of the oldest formations of the earth's crust. The bedrock shield is made up mainly of granites, gneisses, and migmatites,

with some crystalline schists. The Finnish bedrock contains quite a wide range of minerals, although the amount of each is rather small. The most important metals are copper, nickel, zinc, vanadium, chromium and cobalt. Iron is common but mining is not economically feasible. Some uranium occurs, but in amounts too small for production.

The most recent Ice Age had a marked impact on the Finnish soil and landscape. The movements of the ice sheet abraded the bedrock and resulted in the formation of eskers and lake basins. Glacial deposits, e.g. moraines are abundant. The average thickness of the overburden is about 2 metres. It has been estimated that the Finnish soil contains 47,500 million m^3 of detrital material, gravel and sand above the groundwater table.

Another reminder of the Ice Age is the uplift. In Ostrobothnia the land rises by 90 cm and in the Helsinki area by 30 cm in every hundred years. This enlarges the land area of the country by 7 km^2 annually.

2.1.3 Water resources

Finland has 33,522 km^2 of inland waters, i.e. 9.9% of the total area. There are 56,010 lakes with a surface area of over 1 hectare and 187,890 lakes and ponds with surface area of over 500 m^2. The mean area of the Finnish lakes is 18 hectares. The mean depth is only 7 m and the total volume is 220 km^3. The watercourses have relatively low discharge values.

The total number of lakes is very high, but they vary greatly in distribution and size. In coastal areas they are small and few in number. Variations in discharge values are significant in these areas, with the highest values being often a hundred or even thousand times higher than the lowest ones. In summer there are long dry periods. In central and eastern Finland there are numerous lakes, which, together with the connecting rivers and rapids, often form large watercourses. Variations in discharge values are not so marked in these watercourses. In northern Finland there are several lakes which are still in a natural condition, although the largest ones are now regulated. Two large reservoirs have been built in northern Finland and several smaller ones in other parts of the country. Owing to the length of the winter period the discharge values in northern Finland are at their lowest in spring just before the snow melts. Then the water volumes and oxygen reserves in the lakes are below average.

The average water discharge from watercourses into the sea is 3100 m^3/s. During the spring thaw 30-40 per cent of the annual water discharge flows into the sea.

On the whole the soil in Finland is not very permeable, only five per cent of the total area of the country consisting of soil types through which water can easily pass. Accordingly, only two to three per cent of the rainwater infiltrates into the soil and is added to groundwater. Groundwater occurs mainly in gravel and sand eskers. Some groundwater can also be found in glacial till areas and in the bedrock, but it is of primary significance only to the water supply in sparsely populated areas and to the construction and use of subterranean spaces. About half of the water used by the Finnish waterworks is groundwater. The total

volume of groundwater is 70-90 m^3/s, almost a third of which is in areas classified as important for water supply.

Finland is bordered in the south and west by the Baltic Sea. The coastal waters are shallow and the coastline is fragmented. The scenic beauty of the southwestern Archipelago is unmatched anywhere else in the world. The water in the gulfs of the Baltic Sea - the Gulf of Finland and the Gulf of Bothnia - is brackish; the salinity is only 2-7 per mil.

2.1.4 Flora and forests

Almost the whole country lies within the boreal zone of coniferous forests, which stretches from northern Asia to Scandinavia. Only the southwestern corner of the country belongs to the boreo-nemoral vegetation (i.e. the oak) zone. In northern Lapland coniferous forests give way to birch forests. The treeless areas of Fell-Lapland belong to the arctic-alpine vegetation zone. True tundra or areas with permafrost do not exist in Finland.

The Finnish flora is fairly uniform because there are no great edaphic differences or topographical formations to prevent distribution. The greatest differences in flora occur in the south-north direction. The northern limit of most species is dictated by the climate; and when the limit is reached the plants are replaced by a fewer number of northern species. Because the whole country was covered by an ice sheet during the most recent Ice Age the flora is relatively young. There are consequently very few endemic species.

The flora includes about 1,350 vascular plant species and 16,000 to 18,000 sporophyte.

Seventy-six per cent of the total land area is forested. This is more than in any other European country. The proportion of peatland (31% of the land area) is the highest in the world. However, approximately 50% of the peatlands has been drained and over half grow enough trees to be ranked as forests. Finland's peat reserves have been estimated at 73 million m^3 but only a fraction will be exploited mainly as fuel. The treeless areas in the southern parts of the country are mainly cultivated land (21%), in northern Finland open peatland (17%) and bare mountain tops (8%).

The dominant trees in areas with meagre soil are pine and in areas with rich and fresh soil spruces. Other species typical of the taiga zone (larch, silver fir and Siberian pine) have not spread westwards to Finland since the Ice Age. Birch is the most common deciduous tree.

Finnish forests consist mainly of coniferous trees. Deciduous trees are found among the conifers, but purely deciduous forests are rare, an the few there are occur mainly in eastern Finland, in areas of former woodland cleared and burned for cultivation.

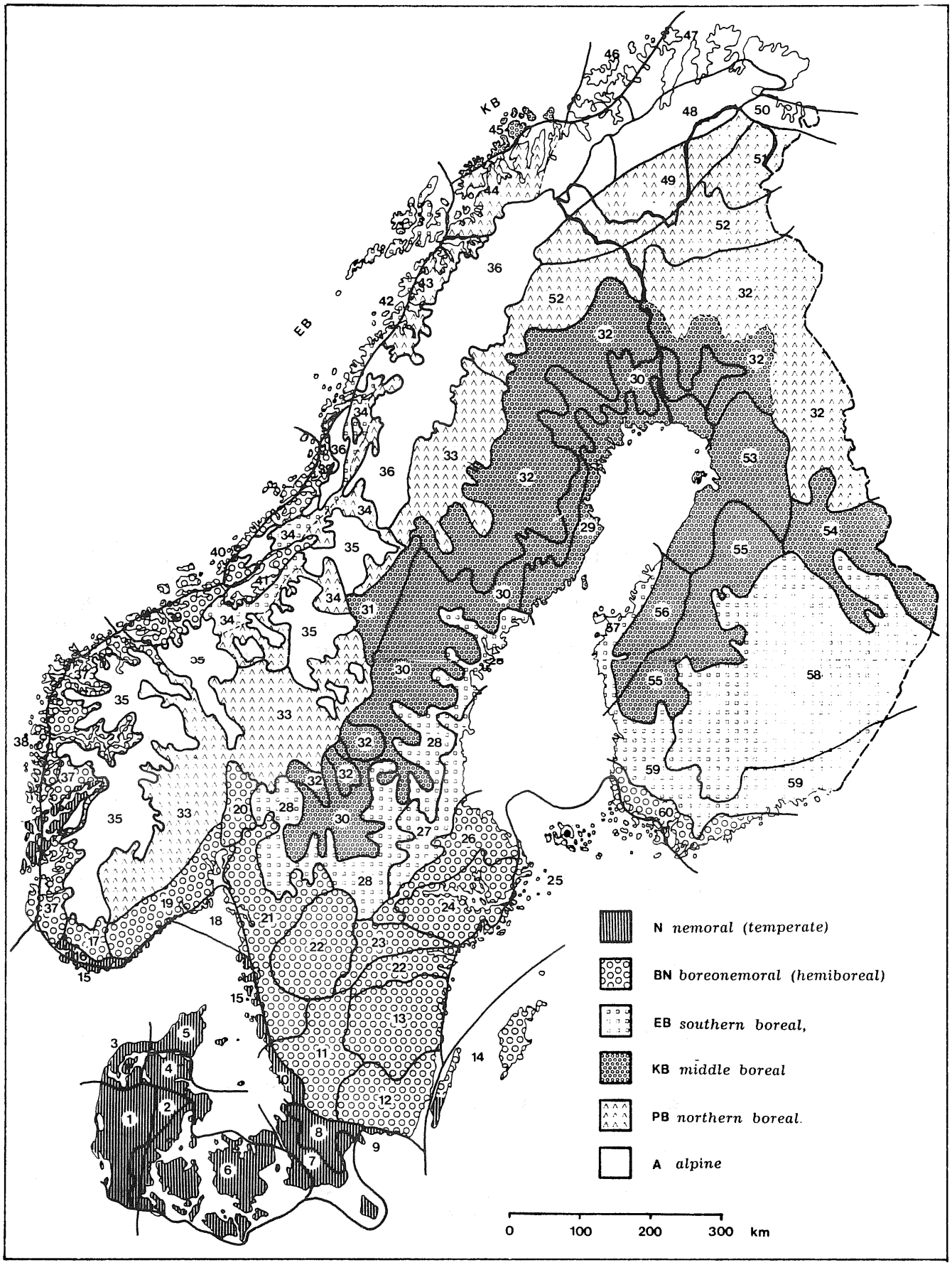

Figure 1. Natural geographic areas or regions.

Source: Kalliola, R. Division of Norden into natural geographic areas. Terra 91.1979.

2.1.5 Fauna

Zoogeographically Finland is part of the Palaearctic region, and the fauna resembles that of northern Scandinavia and the northern USSR. Finland is a transition zone of faunal elements derived from various directions and generated by diverse climatic conditions. In addition to marine species the following groups can be distinguished: arctic, Siberian or taiga, European, palaearctic and cosmopolitan species. The number of individuals of the various faunal groups decreases southwards on the whole.

The recent origin of the Finnish fauna is shown by the very limited number of endemic sub-species. One such is the Saimaa seal (Phoca hispida saimensis), which lives in the Saimaa lake system.

There are 61 native species of wild mammal in Finland. About a third of the species living here permanently have spread over the whole country. The number of large predators - bear (Ursus arctos), wolf (Canis lupus), lynx (Lynx lynx) and wolverine (Gulo gulo) - has varied in recent decades depending on hunting pressure and migration, mainly to and from the USSR. In the 1980s, however, the numbers of all these species except the wolverine, have clearly increased. The estimated number of bears in Finland is currently 450 to 500, that of the wolves around 150, of wolverines about 30 and of lynxes about 600 to 800. The number of elks (Alces alces) has also shown a marked rise recently, and the yearly cull of elks is around 60,000 animals.
About 370 species of bird have been recorded in Finland. Some 230 nest here and the rest are sporadic visitors or migrants flying over the country. The reptilian and amphibian fauna of Finland has only 10 species. In addition there are 66 species of fish, 17,000 species of insect, about 3,000 species of other arthropods and 150 molluscs.

2.2 Population and economics

2.2.1 Population

The first reliable information about the size of the Finnish population dates from the 1750s, when the country had somewhat under half a million inhabitants. Even in pre-industrial times population growth was extremely rapid, for by 1870 it had increased fourfold. In the early stages of industrialization the deathrate dropped sharply, and since the birthrate remained high the three million mark was reached by 1912. After this the birth-rate began to decline slowly and it was not until the 1950s that the Finnish population exceeded four million. Since 1950, the growth has been slow and the present size of the population is about 4.93 million. The net increase in 1986 was 3.2 per mil.

Emigration had a big impact on demographic trends in Finland in the late 1960s and early 1970s when the exceptionally large number of people born soon after the war joined the economically active population and a major change in industrial structure took place. Large numbers of young people emigrated to Sweden, and emigration caused Finland a net loss of population between 1975 and 1981. In 1977, the loss amounted to 10,000 persons. Since then emigration has slackened and immigration strengthened.

After Iceland and Norway, Finland is the most sparsely inhabited country in Europe having 16 inhabitants per km^2. The population density varies considerably, however, being highest in the southern parts of the country. The concentration of the population in the southwest and south of Finland is the result of the heavy rural emigration and urbanization that started in the mid-1950s. At present about 40% of the population lives in rural areas and 60% in towns and urban districts. Urbanization first affected remote districts and other areas where the inhabitants are scattered. Subsequently, small population centres also began to lose of their inhabitants. The larger cities, in particular the Helsinki area, have grown most rapidly. But in recent years the decline in rural population has been curbed, and the growth of urban population has slowed down correspondingly.

Table 1. Towns with a population of 50,000 and over, 1986.

Town	Population
Helsinki	485,626
Tampere	169,153
Turku	161,508
Espoo	156,851
Vantaa	143,986
Oulu	97,329
Lahti	94,467
Pori	78,365
Kuopio	78,166
Jyväskylä	65,291
Kotka	58,954
Vaasa	54,359
Lappeenranta	54,102

Finland has two official languages: Finnish and Swedish. The importance of Swedish has been declining steadily; those who speak it as their mother tongue constitute only a little over 6% of the population today. It is spoken mainly along the south and west coasts and in the Åland Islands. Slightly more than 10 000 people belong to other language groups. Of these, the most important is Lappish (sabme in Lappish), spoken by the native Lapps (Sami) in northernmost Finland.

2.2.2 National economy

Aggregate output in Finland in the present century has grown slightly faster than in the industrialized market-economy countries on average. The GDP at the beginning of the century was less than a tenth of what it is today.

The GDP grew at an annual average rate of 2.8 % in 1980-1985. Growth is expected to be slightly faster for the rest of the present decade. The estimated course of total demand and supply in the Finnish economy and that of certain other important factors up to 1992 is presented in table 2.

Table 2. National balance of demand and supply.

	1986	Annual volume change %	
	Billion FIM	1980-85[1)]	1987-92[2)]
GDP in purchaser's values	358	2.8	3.0
Imports of goods and services	91	1.9	4.0
Total supply	449	2.6	3.25
Exports of goods and services	96	2.9	4.5
Consumption	266	3.2	2.75
• private	193	3.0	2.75
• public	73	3.7	2.25
Gross fixed capital formation	82	2.6	3.0
Change in stocks (incl. statistical disperancy)	5	..	..
Total demand	449	2.6	3.25

	1986[1)]	1992[2)]
Unemployment rate, %[3)]	5.5	4.75
Net foreign dept, % of GDP	14.0	15.0
Total taxes/GDP, %	37.2	37.0
State dept, % of GDP	14.5	16.0

1) preliminary data
2) a goal-oriented scenario
3) according to the new statistical practice

Source: Ministry of Finance, September 1987.

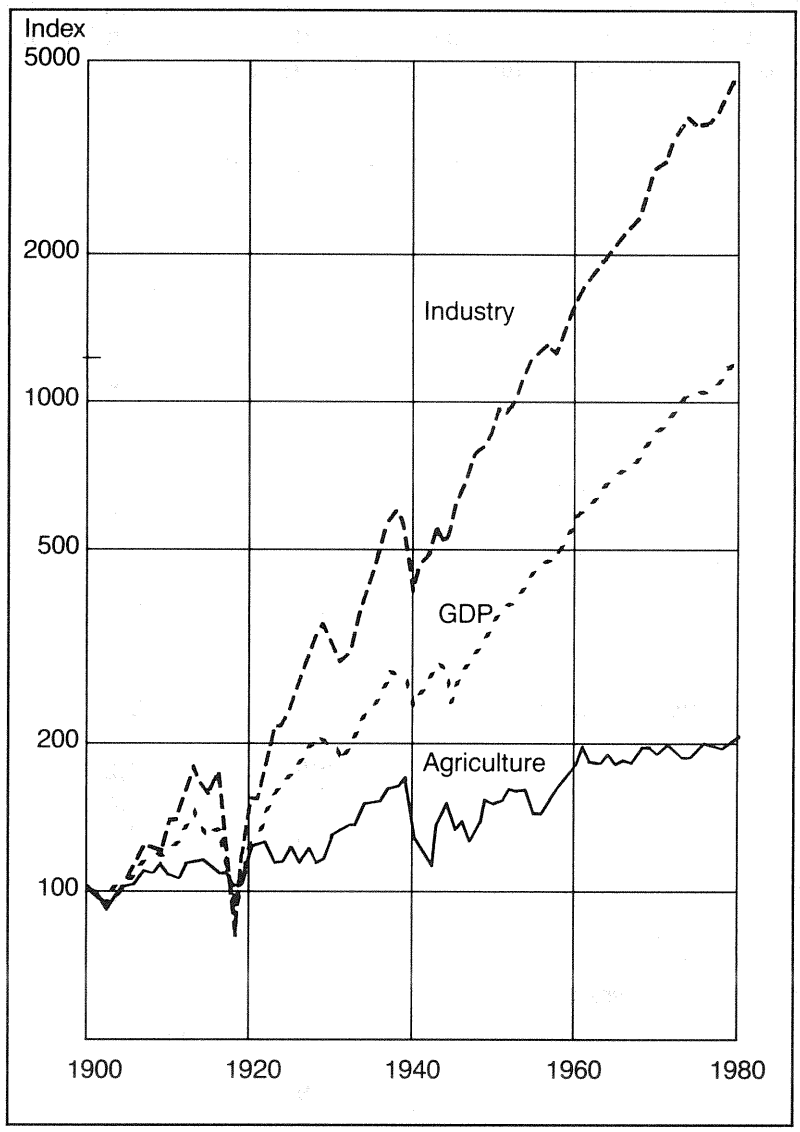

Figure 2. Finnish GDP in 1900-1980. (index of volume: 1900 = 100)

Source: Economic Planning Centre, 1981. Finland 1995 Economic Prospects. Helsinki.

Finland was still an agrarian society at the turn of the century. Agriculture accounted for a clearly higher share of total output than in Western European countries on average. The agricultural population also represented a higher proportion of the national total. However, the structure of production has changed sharply since then. Although agricultural and forestry output has slightly more than doubled, industrial output has increased 50 times (figure 2).

As recently as 1948 primary production accounted for a third of GDP, compared with less than a tenth today (table 3). Manufacturing industry's

and construction's proportional shares were approximately the same in the late 1940s as they are now. Services today account for more than half of GDP, compared with about a third in the late 1940s. Table 3 also shows an estimate (taken from the Ministry of Finance's Medium-Term Prospects 1987) of how different sectors are expected to grow until the year 1992.

Table 3. Value-added, by type of economic activity.

	1986	Aver. year-on-year change	
	Share %	1977-1983 %	1987-1992[1] %
Primary production	8	2.75	0.5
Industry	28	5.25	3.75
Construction	7	2.25	2.25
Services	41	4.25	3.25
Producers of government services	16	4.25	2.25
GDP (basic value)	100	4	3

1) a goal-oriented scenario

Nearly 70% of the labour force worked in agriculture and forestry at the beginning of the century, compared with about 10% today (table 4). Services currently engage more than half the labour force, with the public sector accounting for more than a third of this share. The breakdown by sector is not expected to change appreciably in the period up to 1992.

Table 4. Breakdown of employment by sector, %.

Year	1938	1965	1987[1]	1992[2]
Agriculture and forestry	51	30	11	9
Industry	19	23	23	23
Construction	7	9	8	7
Services	23	37	58	60
Total	100	100	100	100

1) preliminary data
2) a goal-oriented scenario

Table 5. GDP by sector, 1960-2000.

	Value,	Annual volume change, %			
	1985[1)]	1960-1973	1973-1985	1985 - 2000[1)]	
	Billion FIM			Growth alternative	Disturbance alternative
Agriculture, fishing and hunting	12.8	-0.3	1.8	0.0	0.0
Forestry, logging	11.4	0.2	0.6	1.4	0.0
Mining and quarrying	0.9	4.1	1.8	0.0	0.0
Manufacturing	78.8	6.6	3.3	3.5	1.8
• Food, beverages and tobacco	8.6	5.1	2.3	2.4	2.0
• Textiles, clothing and leather	5.3	3.9	1.6	1.1	1.0
• Wood, wood and cork products, and furniture	6.2	4.6	1.5	1.8	1.0
• Paper and paper products	10.6	7.0	2.0	4.2	2.0
• Printing, publishing and allied industries	5.8	4.3	4.2	3.3	2.0
• Chemicals, chemical, petroleum, coal, rubber and plastic products	9.0	13.1	2.6	3.6	0.9
• Non-metallic mineral products (excluding petroleum and coal products)	4.0	10.4	3.3	2.0	0.0
• Basic metal industries	3.3	10.4	6.0	2.5	1.0
• Fabricated metal products including machinery except electrical	25.3	6.8	5.2	4.6	2.5
• Other manufacturing	0.7	7.0	2.7	3.3	1.6
Electricity, gas and water	10.7	8.1	4.1	3.5	1.5
Construction	22.7	3.7	0.8	1.0	0.0
Trade, restaurants and hotels	33.3	6.2	1.9	3.0	1.0
Transport, storage and communication	23.9	5.4	3.2	3.6	1.6
Financial institutions and insurance	25.8	5.9	6.1	3.6	1.5
Ownership of dwellings	20.6	5.2	4.3	3.0	2.0
Producers of government services	46.7	4.9	4.3	1.7	1.0
Other services	17.2	3.4	1.6	2.6	1.5
GDP in basic value	297.3	4.6	3.0	2.7	1.3

1) forecast

Source: Economic Planning Centre, Report 19. Helsinki, 1986.

The investment ratio, i.e. capital formation relative to GDP, is comparatively high in Finland and continued to rise until the mid-1970's. It has been declining since then but is forecast to stay at about its present level until 1992.

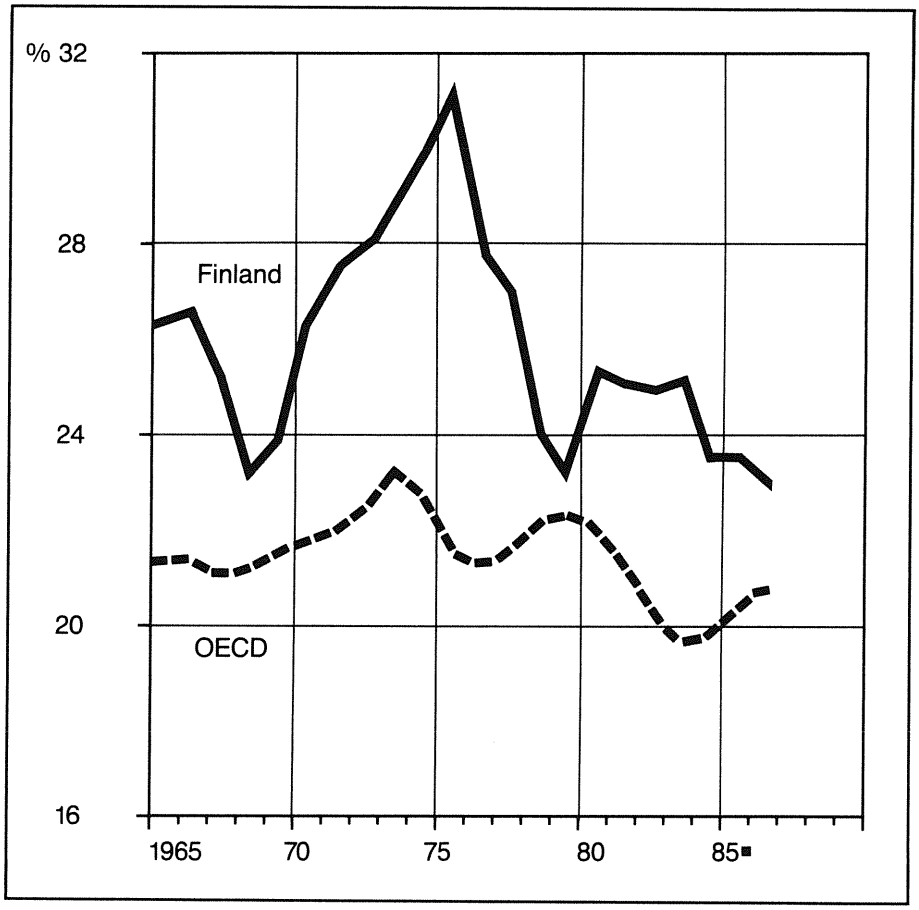

Figure 3. Investment ratio
(Fixed investments as a proportion of GDP).

Source: Ministry of Finance.

The investment requirement is being reduced by slow growth in housing and other basic structural investments. Rather poor growth prospects, often coupled with a fairly high degree of indebtedness, for oil refining and other industrial, mainly highly capital-intensive, sectors are having the same effect.

On the other hand, pressure for investment is being caused by rapid technological development, which shortens the economical life span of capital goods. Stricter environmental protection regulations, which require investments in anti-pollution equipment and structural alternations in processes, are also conducive to a higher level of investment.

The replacement value of the gross capital stock was more than 1,600 billion ($1,6 \times 10^{12}$) finnmarks in 1985 (calculated using the perpetual inventory method). The current value of production capacity, i.e. the net capital stock, was more than 1,000 billion (10^{12}) finnmarks the same year.

A third of the capital stock consists of production capacity of primary production and processing. More than half the capital stock in the services production sector consists of dwellings.

Table 6. Age structure of the capital stock in 1980.

	Under 5 years, %		Under 10 years, %	
	Manufacturing	Whole economy	Manufacturing	Whole economy
Buildings	21	21	49	42
Other structures	13	18	40	37
Machinery, transport equipment and other equipment	33	37	68	75
Whole capital stock	27	24	58	49

Source: Economic Planning Centre, 1981.
Finland 1995 - Economic Prospects. Helsinki

Finland's dependence on the world economy has clearly increased since the beginning of the century, because foreign trade has grown nearly twice as fast as GDP. A quarter of the country's disposable income is currently derived from exports.

More than half of total foreign trade is with four countries: Sweden, the Soviet Union, the United Kingdom and the Federal Republic of Germany. A quarter of foreign trade is conducted on a bilateral basis with the Soviet Union, the German Democratic Republic and Bulgaria. In this kind of trade, an approximate balance is maintained between imports and exports and since a very large proportion of imports to Finland consists of energy, exports depend heavily on the development of energy prices.

A breakdown of Finnish visible exports by trading group indicates that the EC's share is just under 40%, with EFTA, the CMEA ("COMECON") countries and the rest of the world taking approximately 20% each. The

breakdown of visible imports by trading group is approximately the same.

The structure of the commodities range exported by Finland has changed quite radically. Forest-derived products accounted for three-quarters of the total in 1960, but their share had declined to under 40% by the mid-1980s. The value-added content of forest products rose very substantially during the same period. Whereas metal-based products accounted for only 15% of exports a quarter of a century ago, this share has since risen to about the same level as that of forest-derived products.

The breakdown of visible imports by main category has not changed as strongly as that of exports. The greatest change has occurred in energy imports, whose share has increased from about a tenth of the total in 1960 to a quarter in 1985, mainly due to price rises. The share of energy imports is assumed to decline in the future.

Table 7. Exports and imports (incl. services) by main category in 1973 and 1985 (in billions of finnmarks at 1985 prices).

	Exports		Imports	
	1973	1985[1)]	1973	1985[1)]
Forestry and forest industry	27	33	2	3
Mining, metals and metal products	14	32	25	31
Other manufacturing	6	14	15	24
Energy	1	5	17	19
Agriculture and food products	2	5	4	5
Transport services	5	7	3	4
Other services	7	11	8	11
Total	61	106	75	97

1) preliminary data

The unemployment level has been clearly higher in recent years than before the middle of the 1970s. However, it is a substantially worse problem in other European OECD member states (figure 4).

A shift in emphasis is occurring in labour-market problems. Although the grip of unemployment is believed to slacken a little, disparities between regions and occupations are threatening to worsen.

The Finnish people's living conditions and livelihood prospects have improved substantially in recent decades. Households' real per capita disposable incomes were about two and a half times as high in 1985 as in 1960. Income differences between households narrowed in the same period.

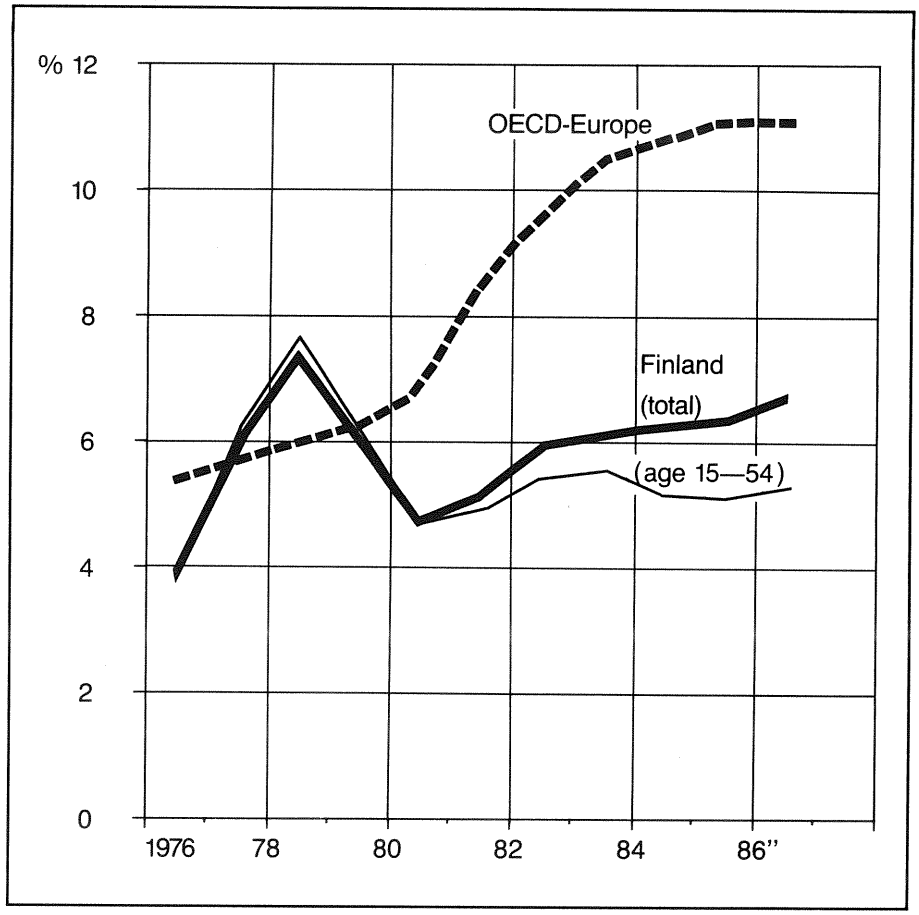

Figure 4. Unemployment in Finland and OECD European members in 1976-1986.

Source: Ministry of Finance.

Calculated at market prices, per capita GDP in 1986 amounted to about 73,000 finnmarks per year or about 6,1000 a month. Households' disposable incomes came to about 3,300 per capita a month. The lowest decile of households had in 1982 an average disposable income (per household) about one eighth that of the highest decile. The per capita distribution is much more even.

The importance of social transfers has grown strongly in recent decades. This is due to the creation of new benefits, expansion of their coverage and higher levels of benefits. Changes in the goals set for minimum livelihood levels have also increased spending. The goal of ensuring a minimum level of livelihood has been replaced by that of safeguarding a moderate level. The reforms in pension, health insurance and unemployment benefit systems are indicative of this change of thinking. On the whole, the social security system can be considered quite comprehensive and highstandard in comparison with most other countries.

By international standards, the development of social security spending in Finland has not been exceptional. Its share of GDP is very close to the average for industrialized market-economy countries.

Table 8. Social security expenditure as a proportion of GDP in Nordic countries, %.

	1960	1970	1983
Finland	8.3	13.6	23.5
Sweden	10.9	17.9	35.7
Norway	9.8	17.9	30.7
Denmark	9.8	17.9	30.7

2.2.3 Industry[1)]

The growth of the industrial production has in Finland during the last hundred years been one of the fastest in the world. The production volume has had an average annual growth rate of more than five per cent.

At the end of the 19th century textile, wood processing and metal industry were the most important industrial branches. The first pulp mills were built already in the 1880s. Sawn wood production continued, however, to be the most important sector of wood processing industry

until the 1950s when it was exceeded by pulp and paper production. Forest products industry was the largest industrial sector in the 1920s and 1930s but its share has since then decreased substantially.

Metal and engineering is at present the largest industrial sector in Finland, accounting for about a third of industrial value added. It has been one of the fastest-growing sectors in the country, with a growth

1) Agriculture, forestry and energy management are dealt with in chapters 3, 4 and 5 respectively

rate rapid even by international standards. Its growth has derived from periods of strong investment in the forest products industry, expansion in the basic metallurgical, shipbuilding and automotive industries as well as major investments in the energy and housing sectors. Steelmaking accounts for about two thirds of output in the basic metallurgical industry.

The metal industry is expected to grow more slowly in the period up to the end of the century than it has done in the past, but will probably remain one of the fastest growing sectors nonetheless. Electrotechnical and engineering products are expected to be the fastest growing parts of the metal industry.

More than a fifth of total industrial value added is created in the forest products industry. In recent years, however, this sector has been growing clearly slower than the metal industry. Growth in the forest products industry has long been based on raising the degree of processing: the amount of raw wood used has increased over six times this century, whereas the volume of output has grown forty times. In recent years the emphasis in the pattern of the paper industry's production has been shifting more and more onto printing and writing papers. It is expected that those products will make a particularly important contribution to safeguarding future growth in the industry.

The chemical industry grew faster than any other industrial sector in 1960-73, but has been growing slower than the industrial average for more than a decade. It currently generates a little over 10% of total industrial value added. Oil refining's share of the chemical industry's output is a quarter. The chemical industry's growth in the 1960s was powered not only by oil refining, but also by basic chemicals, fertilizers, industrial chemicals and a considerable increase in petrochemicals capacity. Production of pharmaceuticals, paint, plastic products, technochemical products and other consumer-type products is expected to grow faster in future than the total chemical industry.

The volume of industrial output more than trebled in 1960-82. Establishment size has increased quite considerably, because their total number rose by only about 10% in the same period. In 1982 there were 8,200 industrial establishments employing at least 5 persons each.

The relatively few large establishments play quite a central role in the pattern of Finnish industry. In 1982 only 15% of establishments employed 100 people or more, but they accounted for more than 70% of total industrial output in terms of both gross value and value added. This concentration is even more striking when one proceeds from the establishment to the company level: 37 companies (0.6% of the total number of industrial enterprises) accounted for half of total gross industrial output in 1982. In addition to this, Finnish industry is strongly concentrated in the southern part of the country.

Ninety per cent of industrial establishments were in private Finnish ownership in 1982. 64% of these were juridically constituted as joint-stock companies. Four per cent of industrial establishments were state-owned (68% of them having the joint-stock corporate form). Municipalities or inter-municipal joint authorities owned 3% of the country's establishments. Establishments in which foreign interests owned shares of 20% or more represented slightly under 3% of the total.

The State is the majority shareholder in many industrial undertakings, especially the largest ones. In 1982 state-owned companies generated about 15% of industrial value added. Half of the chemical industry's output is accounted for by state-owned companies.

2.2.4 Health and social security

The average life expectancy in Finland was, in 1984, 70.4 years for men and 78.8 years for women; The increase among males has been one of the fastest in Europe and the difference between male and female life expectancies has narrowed slightly as in most other Nordic countries. In 1984, the infant mortality rate was 6.5, which was one of the lowest in the world; in 1981 the maternal mortality rate was 4.7 per mil 1981. Regional variations in adult mortality still exist, the mortality rate in the northern and eastern regions being higher than elsewhere in the country.

The two most important causes of death in 1983, i.e. diseases of the circulatory system and neoplasms, accounted for 74% of all deaths. Since the early 1970s, there has been a declining trend in diseases of the circulatory system. The mortality from all malignant neoplasms for the under-65s has decreased by 1.2% per year in the 1970s. The mortality rate for cancer has also decreased as has that for external causes, especially from motor vehicle accidents.

A health services system based on primary health care has been the basis of the Finnish health strategy since the beginning of the 1970s. The Primary Health Care Act of 1972 provided for the integration and intensification of primary health services through the creation of municipal health centres, and for coordination between the hospital and the primary health care systems through a unified planning and financing system. The tasks of the health centres include preventive health care, primary health care, school health care, dental care and transportation for the sick. Almost all health care centres in Finland also have a ward or hospital. Environmental health services, including food inspection and occupational health services, are closely linked to the planning and financing system and administration of primary health care at the municipal level.

Finnish social security has developed relatively fast over the past few decades. Social costs amount to over 20% of the GNP. Social security covers all social risks, and social insurance has become a predominant sector of social security. Social insurance consists of health insurance, pension insurance, unemployment coverage and accident insurance. The expansion of the social insurance system and improvement in its coverage have reduced the need and scope of other social security means. However, various forms of support under family policy and social services, particularly those for the elderly and the handicapped, are of permanent significance.

2.2.5 Housing

There were 1,838,000 dwelling units in Finland in 1980, and 1,728,000 of these were occupied. The total number of occupied dwellings increased by 309,000, or 22%, in the 1970s.

More than 10 dwellings per 1,000 inhabitants were built in Finland each year in the 1970s. Housing production was noticeably vigorous in the middle of the decade, the peak being reached in 1974. Since that year, there has been a steady decline in housing production.

Because of the lively rate of production in recent decades, the Finnish housing stock is recent. Three quarters of all residential buildings have been built since the Second World War and a quarter of these in the 1970s.

Table 9. Number of dwellings in 1960, 1970, 1980 and 1985.

Year	Total population	Occupied dwellings	Occupied dwellings per 1,000 inhabitants
1960	4,446,200	1,204,384	277
1970	4,589,300	1,419,082	314
1980	4,787,778	1,728,100	375
1985	4,910,664	1,895,000	389

In the 1970s, two thirds of the housing units completed were in apartment blocks. The ratio was reversed in the 1980s, when nearly two thirds of the dwellings produced were of the detached, semi-detached, row or terraced types. However, due to the large number of apartment blocks built in the 1970s, detached, semi-detached, row and terrace houses now account for a smaller proportion of the total housing stock in 1980 (52%) than in 1970 (56%).

Two types of tenure dominate in Finland: owner-occupancy and tenancy. There are very few dwelling cooperatives in the country; they count for less than 0.5% of the total housing stock. Owner-occupied dwellings accounted for 61% in 1980. Their proportion increased in the 1970s.

The standard of amenities in dwellings has improved quite considerably since the early 1970s. All new dwellings are now built with a full range of amenities. Well-equipped dwellings, i.e. those with plumbing, central heating, indoor toilet, hot water and, in most cases, a bathroom and shower, represented 73.6% of the housing stock in 1980. This compares with 50.1% a decade earlier.

Large dwelling types increased their share of the housing stock in the 1970s. There are now far fewer two-room dwellings than there were in 1970. However, there are still, relatively speaking, as many one-room dwellings (which include a kitchenette) as ten years ago. The average net floor space in dwellings was 69 m^2 in 1980, or 9 m^2 more than a decade earlier. The average number of rooms per dwelling was 3.6 in 1985.

According to a calculation method based on the UN recommendations relating to national income, housing services accounted for about 18% of households' total income in 1980. However, if the actual housing costs paid are taken as the basis, the figure falls to an average of 15% of households' disposable incomes.

The main thrust of housing policy in recent years has been to improve the quality and amenities of the housing stock to correspond to the needs of occupants. New building and renovation may be regarded as parallel means of practical implementation in this respect. What this entails in practice is the abandonment of suburban type settlements in new construction and placing the emphasis instead on supplementary building and on diverting State subsidies towards renovation. The creation of a congenial living environment is one of the main aspects on which special attention is focused.

The renewal of the Basic Renovation Act, which came into force on March 1, 1985, extended the basic renovation loans to cover the whole country: before this, the loans covered only certain experimental areas. The renewed Act also enables loans to be granted for general improvements to the living environment. It has been estimated that, because of the renewal of the Basic Renovation Act, the number of buildings to be renovated each year will, by the end of the century, reach 60,000, of which 15,000 will be renovated with the aid of State loans. At the beginning of the 1980s, about 12,500 buildings were renovated every year.

Suburban areas consisting of apartment blocks were built at a fast rate in the late 1960s and early 1970s. These suburbs were built in areas which lacked services, and thus the community structure was disturbed. Local authorities were not able to build service facilities at the same rate, with the result that many of the suburbs suffered from an inadequate level of services.

The external appearance of many industrially produced dwelling areas bears the stamp of monotony. There are also evident inadequacies in the outdoor areas around buildings, in the communal spaces, and in the planning and realization of joint activities for whole communities.

Since the slackening in the pace of building and the transfer of emphasis from the construction of suburbs in unbuilt areas to supplementary building, local authorities have been able to allocate more resources to improving inadequate services in residential areas.

2.2.6 Transport

The Finnish road network underwent a period of vigorous development in the late 1950s and 1960s. Fewer new roads have been built since then. The network of public roads is now adequate and there is little need for

a new infrastructure of this kind. The condition of existing roads has been considerably improved in the 1970s and 1980s. About 60% of the total road length (75,700 km) is now surfaced with asphalt or oilgravel.

Road planning is regulated by the Public Roads Act, which includes the provision that "a road is to be routed and built in such a way that its adverse environmental effects and those of the traffic on it are minimized". Planning is supervised by the National Board of Roads and Waterways, which is subordinate to the Ministry of Communications and sets out general guidelines for road planning. Those guidelines contain practical instructions concerning the procedures and studies required in various planning phases.

Environmental aspects are also dealt with, but there are no detailed instructions as to how the environmental impact should be taken into account (e.g. in comparing alternatives). In 1982 the National Board of Roads and Waterways approved a policy paper on environmental aspects of roads and waterways construction and management. It has also published other studies and guidelines concerning environmental protection, but these are unofficial.

In the period 1970-80, the number of passenger cars in Finland increased by about 72%. In the end of 1986 there were 1,8 million cars of which 1,6 million were passenger cars. The bus transport network is also relatively dense and thus road transport accounts for over 90% of the total number of passengers carried in the country. Road transport increased its share of the overall passenger traffic performance factor by 44% in the 1970s and its freight traffic performance factor by 32%.

A key problem in urban areas is the shortage of bypasses, which contributes to traffic congestion, causes environmental damage and increases the accident rate. The congestion is particularly bad at weekends, when it is aggravated by the inadequate capacity of some trunk routes. Most of the congestion-prone roads are in the vicinity of the largest towns and cities in southern Finland and on the access roads to Helsinki.

Railways are another form of transport that have contributed to the development of population centres. They have been particularly importance in determining the location of production facilities, especially heavy industry.

Most of the country's railway network dates from the period before the Second World War, since when it has been supplemented to some extent by improving cross-links and covering some new centres. The permanent network is centered fairly heavily on Helsinki and designed to serve traffic to and from coastal areas. There are about 9,000 km of tracks, with 6,000 km serving passenger traffic. Railways account for 7% of the total traffic and for 25% of goods traffic.

The importance of inland waterways in the country's transport pattern is also considerable, especially for floating wood. (There are 41,500 km of log-floating routes.) Because of the winter ice-cover the floating season is limited. There are 6,675 km of navigable inland water routes in Finland. The most important water body is Lake Saimaa, which - thanks to the

Saimaa Canal reopened in 1968 - has a network of 520 km of deep channels.

Inland navigation, and in particular log floating, together with the availability of water and hydro-power, have influenced the location of production facilities: most of the country's wood-processing plants are located at the confluence of inland waterways or on the coast at the mouths of rivers. Only cargo transport is of major importance; most passenger services on inland waterways are used by tourists.

More than 80% of the goods imported to and exported from Finland are shipped by sea. There is also a major volume of passenger traffic, especially between Sweden. The long and severe winter hampers shipping and makes the fleet of powerful icebreakers a necessity.

There are 21 airports with regular scheduled flights. Those serving the largest numbers of passengers are Helsinki, Turku and Oulu. Air services account for about 1% of passenger transport in Finland. About 60% of people travelling between Finland and countries outside scandinavia are carried by air.

2.2.7 Tourism

Tourism accounts for 4.3% (1986) of Finnish exports of goods and services and for 1% of GNP. The industry gives direct employment to some 60,000 people, and seasonal work to several thousand more.

The natural environment, especially the lakes and forests, is the most important tourist attraction in Finland. National parks and other recreation areas including camping sites are, therefore used very actively by both foreign tourists and Finnish holidaymakers. The number of holiday residences, most of which are by lakes or the sea, is also very high (280,000 in 1980) in proportion to the population. The recreational use of nature is discussed in greater detail in chapter 12.

Most foreign tourists come from Sweden, with many also from Norway, the Federal Republic of Germany, USA, England the Soviet Union and France. They spend an average of two million nights a year in hotels and other forms of accommodation.

Increased leisure for the Finns themselves has also boosted demand for tourist services. Spending on recreational and leisure activities has been increasing considerably faster than household consumption as a whole. Most of the Finnish holidaymakers spend their holidays in their own country, about 20% of them in their own or otherwise cost-free holiday residences. About 20% go abroad for their holidays.

The Finnish Tourist Board is a government organization for the administration and promotion of tourism. The Board is subordinate to the Ministry of Trade and Industry and is headed by a Board of Directors. The Ministry of the Environment is represented on both the Board of Directors and the Advisory Council of the Finnish Tourist Board.

2.3 Political structure

2.3.1 History

Up to the 12th century the present region of Finland formed a political vacuum that interested both its western neighbour Sweden and the Roman Catholic Church, and its eastern neighbour Novgorod (Russia) and the Greek Orthodox Church. The roman Church and Sweden won the race, and in the middle of the 12th century southwestern Finland came decisively under Swedish rule. In the following century Sweden extended this area eastwards. The Treaty of Pähkinäsaari (Nöteborg, Noteburg) signed in 1323 between Sweden and Novgorod resulted in western and southern Finland being drawn into the cultural sphere of western Europe, whereas Karelia and eastern Finland were drawn into that of the Russian-Byzantine world.

Under Sweden the Scandinavian legal and social systems were established in Finland. The most important centre was Turku (Åbo), founded in the 13th century, which was also a bishop's see.

During Sweden's era as a great power (17th century and the early 18th century) the Swedish central government was tightened, and Finnish administration and conditions were brought into conformity with those of the mother country. As a consequence of the centralization policy of the government, was promoted Swedish as the language of administration.

Several wars were fought between Sweden and Russia over the territory of Finland in the 18th century. Although the Swedish army was defeated and the country suffered big territorial losses during the 18th century the main part of Finland stayed under Swedish rule until 1809, when Finland was finally ceded to Russia.

By joining Russia, Finland became an autonomous Grand Duchy. The Czar was also the head of state of Finland, the Grand Duke, and was represented by a Governor-General. Finland's highest organ of government was the Senate, whose members were Finns. The most important decisions concerning Finland had to be submitted to the Grand Duke, and were presented directly to him by a Ministerial Secretary of State posted in St. Petersburg. Constitutionally Finland and Russia thus formed a union.

During the period of autonomy the Finnish national movement flourished, the consequences of which included a division of parties based on language. Right at the end of the 19th century, the language conflict began to turn slowly to the advantage of the Finnish side. That the status of the Finnish language would continually strengthen was guaranteed by the fact that only one seventh of the whole population spoke Swedish as their mother tongue.

Towards the end of the 19th century the Russians began a systematic attack of Finland's autonomy. The February Manifesto of 1899, which reduced the power of the Finnish Diet and signified to what amounted to a takeover, was the beginning of the first period of oppression. During this period the crucial issue in Finnish politics was no longer the language question but the attitude towards Russia. The key question was

whether to give way to russification, or whether to launch some kind of opposition.

The losses suffered by Russia in the war against Japan forced the Czar into temporarily liberalizing the Russian government, and Finland was granted a new act regulating the Diet. It was the most radical parliamentary reform in Europe, for the Diet of Four Estates was replaced in one go by a unicameral Parliament, with universal and equal franchise. Finnish women were the first in Europe to obtain the right to vote in national elections, and full political rights in other respects. During the second period of oppression (1908-1914) russification was extended to Finnish organs of government, and appointments went mainly to Russian officials.

During the First World War separatist intentions strengthened in Finland and after the October Revolution in Russia the Senate, declared Finland independent on December 6, 1917. The new state was immediately embroiled in a civil war in which the forces of a revolutionary socialist government trying to establish a socialist state were defeated in May 1918.

2.3.2 Constitution and the national-level administration

The Finnish Constitution was promulgated in 1919, two years after the country gained independence. It established an original type of republican regime combining the principles of the parliamentary and presidential systems. The members of the Cabinet are responsible to Parliament, but at the same time important powers have been conferred on the President of the Republic, who is chosen every six years by an electoral college, itself elected by universal suffrage.

Supreme executive power is thus vested in the President. However, the presidency has only a relatively limited staff and thus cannot undertake to exercise direct and detailed authority and guidance over the various executive bodies.

Legislative power is exercised by Parliament, but the President has the right to initiate legislation by introducing bills to Parliament; he may also issue decrees on administrative matters. The President may dissolve Parliament and order new elections. The President determines Finland's relations with foreign powers although decisions on war and peace and the most important treaties concluded with foreign powers require the approval of Parliament. In the exercise of his authority, the President is bound to co-operate with Parliament through the Council of State[1)] since his decisions must be made "in the Council of State" and countersigned by the competent Minister in order to come into force. In this way, the Cabinet assumes responsible for the President's decisions, and its members are, of course, responsible to Parliament.

1) In the broadest sense, the Council of State includes, in addition to the Prime Minister and Ministers, the Ministries directed by them, the State Council Office and the Chancellor of Justice and his staff. The word "government" is often used to designate the President and the Council of State as a whole.

The President of the Republic appoints a maximum of 18 Ministers, including a Prime Minister. Ministers act as heads of one or more ministries, deal with matters in special spheres assigned to them or act as ministers without portfolio.

The Council of State also includes an apolitical government employee, the Chancellor of Justice, who is the highest guardian of the law. The members of the Council of State are politically responsible to Parliament for their actions when in office. Five members of the Council constitute a quorum. Some matters are attended to within a general session after first being prepared by the relevant ministry; other matters are decided in the ministries themselves.

The leader of the Council of State is the Prime Minister. Legally, he does not have the power to command his Ministers, and his vote in sessions of the State Council carries no special weight. The central position of the President limits the growth of the Finnish Prime Minister's influence and prevents him from becoming as prominent a figure in political life as is the case in countries under more straightforward parliamentary systems.

In practice, the Council of State consists of 12 Ministries: the Ministry for Foreign Affairs and the Ministries of Justice, the Interior, Defence, Finance, Education, Agriculture and Forestry, Communications, Commerce and Industry, Social Affairs and Health, Labour, and the Environment.

The Ministry of the Environment was established after a lengthy political debate on October 1, 1983. The responsibilities of the Ministry are the protection of the environment including nature, the protection and development of the built-up environment, the improvement of housing conditions and the development of human settlements in general. These tasks were formerly carried out mainly by the Ministry of Agriculture and Forestry and the Ministry of the Interior.

Under several Ministries there are more or less independent National Boards, such as the National Board of Waters and the Environment, the National Board of Roads and Waterways and the National Board of Forestry, many of which have functions relating to the protection of the environment or the use and control of land and water and their resources. Of these, only the National Board of Housing and the main part of the National Board of Waters and the Environment are subordinated to the Ministry of the Environment. The National Boards generally have a fair amount of power in matters relating to their expertise. Some of them also have district organizations covering the whole country.

2.3.3 Parliament

The Finnish Parliament is unicameral. It is made up of 200 members elected every four years by direct proportional representation. There are at present (1987) ten parliamentary groups representing eight political parties and the Green Movement in the Parliament. Parliament assembles annually on the first of February without any special summons. For discussions of special matters, Parliament sets up several committees including a Grand Committee, a Constitutional Committee, a Legislative

Committee, a Foreign Affairs Committee, a Finance Committee and a Bank Committee.

The Members of the Council of State must enjoy the confidence of Parliament and are responsible to the latter. The most common method of putting this political responsibility to the test is through an interpellation put to the Government by Parliament.

The Committee system occupies a central position in the work of Parliament. Committees do not have independent decision-making powers. Their task lies in preparatory work and the presentation of proposals to Parliament. All important matters must be prepared in a Committee before final consideration by Parliament, and some matters must be dealt with by a number of committees. In Finland, as in other countries, the growth and increased specialization of legislative work has shifted the centre of gravity in discussions to Committees, where the issues at hand can be examined in greater detail than in plenary sessions. Committees may also call upon outside expertise for advice. There does not as yet exist an Environmental Committee. Some members of the Parliament representing different parties have, on the initiative of the Finnish Association for Nature Protection, formed an Environment and Nature Group within which environmental matters are discussed.

The changes in the organization and functioning of Parliament when confronted by increasingly technical issues are reflected in its composition. However, the professional background of the members of parliament correspond relatively well with the professional distribution of the population as a whole.

The traditional watershed of Finnish party politics has been the opposition between socialists and non-socialists (left-right) on the basis of social class. But other factors have affected the party system: countryside versus city, and Finnish versus Swedish language. Since the 1970s the significance of class differences in party divisions has diminished but the effect of other clashes of interest and attitudes to political issues has increased. Ever since Finland gained independence, there has been a non-socialist majority in Parliament almost without interruption. In the present Parliament, the non-socialists hold 116 seats and the socialists 84 seats.

2.3.4 Regional and local administration

Administratively, Finland is divided into provinces and municipalities. There are 12 provinces, each having a Provincial Office headed by a Governor. Provincial Offices, each of which have an Environmental Protection Division, act with supreme executive authority in their respective areas. The Province of Åland has special autonomous status and its own legislation relating to various issues, e.g. the protection of the environment.

In some sectors, e.g. water management, the State administration has its own district offices. These offices cover areas not always equivalent to the provinces. The district offices are subordinated to the respective National Boards.

Local self-government is separate from the State administration. For this purpose there are 461 municipalities of which 94 are towns. The municipalities are responsible for schools, health and sickness care, social care, building and certain other areas. Municipal decision-making also enjoys a large measure of autonomy in questions relating to community planning. The State supports the local authorities' budgets with considerable aid and participation. In return the State retains powers of control over the local authorities.

The central decision-making organ of the local authorities is the Municipal Council, which is elected by direct and proportional representation. There are 17 to 85 members depending on the size of the municipality. In the elections the whole municipality counts as a single electoral district. Because of this, relatively small political groups can be represented on the Council. The Council elects its own chairman. The executive organ is the Municipal Board, proportionally elected by the Council for two years at a time. In addition, the Council elects a large number of statutory and voluntary boards (committees) for various administrative tasks. Because of the method of election, all parties are represented on the Municipal Board and other boards in the same proportion as in the Council. Tens of thousands of citizens participate in the various posts of public trust in local government.

The Mayor, who is chosen by the Council, is the head of the local government machinery and responsible to the Municipal Board.

For tasks involving co-operation between several municipalities - such as health and sickness care, vocational education and district planning - the municipalities can establish separate inter-municipal corporations. There are about 400 of these.

II INTEGRATION OF ENVIRONMENT AND MAIN NATURAL RESOURCE BASED POLICIES

3 AGRICULTURE

3.1 Agricultural production

In spite of its northern location Finland has developed into a high-level agricultural country, self-sufficient in most agricultural products, and a country which also exports certain agricultural products to a relatively large extent.

The growth period is fairly short but due to Finland's favourable climate wheat, rye, barley, oats, oil plants, potatoes and sugar beet can be grown in the country. In fact Finland is the northernmost country where these plants are grown.

3.2 Agriculture and economy

In Finland agriculture and forestry are closely linked. Nearly every farmer owns some forest land. Private farms account for some 35% of the total forest area. Previously they accounted for even more, but inheritance, sale and migration have resulted in a partial shift in ownership.

New production methods have reduced the need for agricultural labour. Young people have moved over from agriculture to other occupations which can often offer them a better living. In 1960 those employed in agriculture accounted for 32% of the working population. At the beginning of the 1980s the figure was only 10% and in 1986 it was 8%. As a result the number of farms has decreased by a third in twenty years, and farm sizes have increased. The number of part-time farmers has grown. The relative importance of agriculture in the national economy has decreased in Finland, as it has in most industrialized market-economy countries. The proportion of agriculture, forestry and fishing in the gross domestic product accounted for over 18% in 1960, but barely 4.4% in 1985.

Agricultural production in Finland meets the domestic demand for basic food supplies. More than four fifths of the raw material used by the food industry are products of domestic crop farming, market gardening and cattle breeding, together with wild mushrooms and berries. The industry processing agricultural products is the third largest industrial sector in Finland, after forest products and metal and engineering.

The export of food in 1986 amounted to a total of 4,849 million finnmarks and accounted for 2.3 per cent of the total rate of export.

One problem of agricultural policy has been production surpluses. Production limits have been exceeded constantly and thus export fees for agricultural products increased by about 2.9 billion Finnmarks in 1986. This accounted for about 7 per cent of farm income. Several supply regulating measures were applied, but their results were not satisfactory. State appropriation on these measures was 412 million Finnmarks in 1986.

Table 10. Level of self-sufficiency.

	Production percentage of consumption		
	1970	1980	1986
Food grain	114	70	107
Dairy products	126	128	131
Beef and veal	110	102	122
Pork	111	119	108
Eggs	138	151	143
Sugar	29	60	71
Fruits and berries			20
Outdoor vegetables	70	90	90
Greenhouse vegetables		73	75
Fish	67	73	67

The most significant new phase in agricultural policy was the enactment of the two-price system for milk in 1985. It does not oblige farmers to reduce milk production, but it prevents further increases in production. Because of strong opposition the legislation was enforced for only one year, but renewed in the following years.

The conduct of Finnish agricultural policy is hampered by conflicting goals. Production should be decreased since export is unprofitable. On the other hand as many farms as possible should remain in production in order to maintain the population of the rural areas. In addition there are still several small farms that cannot generate sufficient income and where production should thus be increased. The conflict seems unsolvable.

In this situation new jobs should be created in the countryside. Agriculture can partly contribute to this process. Raising of furbearing animals, peat production, cultivation of forests for energy production, etc., are examples of supplementary agricultural occupations.

3.3 Farms

There are some 200,000 farms in Finland. A typical Finnish farm is small with about 10 hectares of arable land and 35 hectares of forest. Most dairy farms, with eight to ten cows, are self-sufficient in cattle feed production. Many farms, especially in south-western and southern Finland, specialized nowadays in cereal, beef or pork production and, in western Finland, in fur farming. Crop growing and animal husbandry represent 46% of farmers' income, forestry 25% and other income outside the farm 25%.

The dominance of small farms increased after the Second World War: because of the war, some 11% of Finland's cultivated area was lost, and the refugees who had lost their homes were resettled elsewhere in Finland.

At the same time, settlement activity was also enhanced in other respects. E.g. the front-line veterans, war invalids and other people were entitled to land of their own. State support for settlements was continued until the second half of the 1960s.

The number of farms increased in Finland until the 1960s, but thereafter it has declined rapidly as a result of the rapid mechanization of agriculture, the better income offered by industry and commerce and the aging of farmers. Although the number of farms has decreased, farm sizes have not grown at the same pace. The average arable land area per farm was already close to 10 hectares in the late 1960s.

Table 11. Use of arable land.

Use in thousand hectares	1970	1980	1986	%
Grassland	1174	951	783	35
Cereals, total	1313	1170	1210	53
• wheat	176	124	166	7
• rye	66	53	27	1
• barley	404	533	598	26
• oats	524	448	407	18
• mixed grain	28	12	12	1
Oil plants	7	55	75	3
Sugar-beet	15	32	29	1
Potatoes	60	41	40	2
Other crops	72	19	21	1
Area in production	2526	2268	2158	95
Fallow	48	102	104	5
Cultivated area	2574	2370	2262	100
Area out of production		93	111	
Field reservation	93	98	19	
Arable area, total	2667	2562	2392	
• drained area	510	842	1035	

Of all farm owners 60% are full-time farmers and 15% part timers. A quarter of all farms is owned by retired people or form part of individual inheritances after the death of the original owner. Companies and other corporate bodies own approximately one per cent of the farms in Finland.

Approximately 2.26 million hectares of land are being cultivated at present. In the beginning of the decade about 3,000 hectares of new land were annually cleared for the purposes of cultivation, but when the plans of

coming restrictions of clearing became known to the farmers, the annually cleared area rose to 14,500 hectares in 1986. In June 1987 a new Act concerning clearing charges was promulgated. According to this Act the charge of clearing is 30,000 Finnmarks per hectare of new land. This corresponds to the export costs of agricultural products of the area in 5-6 years. The afforested area was previously about 10,000 hectares annually, but only 3,300 hectares in 1986. The rest of the arable land remaining uncultivated is annually about 10,000 hectares. Most of this is used for new roads and building. In 1986 a total of 130,000 hectares of arable land had ceased to be cultivated of which about 69,000 hectares because of production cutback contracts.

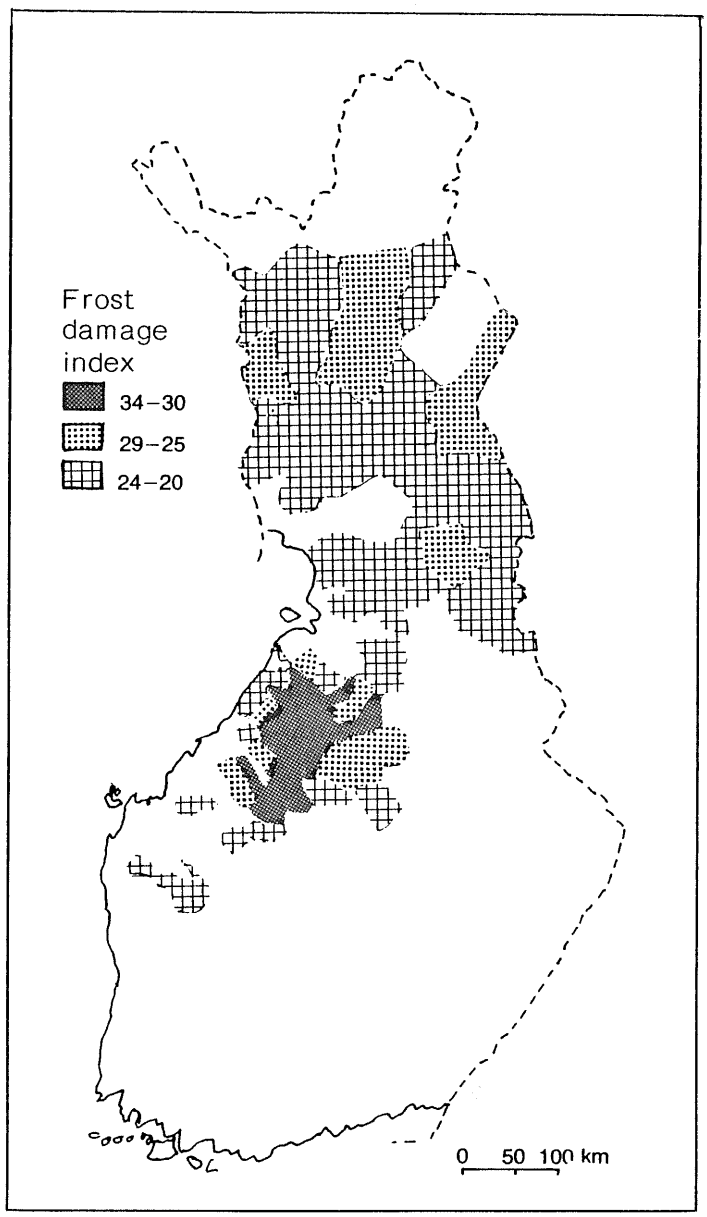

Figure 5. Combination map of frost damage in 1948, 1949, 1952, 1959, 1962 and 1964 per hectares of arable land. The highest index number (dark colour) indicates that the damage (Finnish marks/hectare) has been serious and frequent.

Some 80% of the arable land is under fodder plants. Bread-grain growing accounts for a little more than 10%. The remaining 10% is under potatoes, oil plants, sugar-beet and other root crops.

Because of the climate the crops vary substantially every year. Crop failures are caused by heavy rains occurring during the growing period and particularly at the harvest time, as well as by frost in early summer.

Fields of constant grain growing show some signs of soil compaction. The increasing weight of agricultural machines has not, however, increased their surface pressure in proportion, but compaction can be observed in the arable land of southern Finland. In the Finnish climate the frost in the ground has a decreasing impact on compaction.

Farms account for around 7% of the total energy consumption in Finland. The self-sufficiency of farms in energy consumption is fairly good, as almost a half of the energy demand is satisfied by domestic fuels. In 1986 the consumption of energy by farms was equivalent to the total of 1.65 million tons of oil. The proportion of solid fuels was 46%, oil 42% and electricity 12% of the total consumption. More than a half of the energy was used for the heating of production and residential buildings. The proportions of production and private households were almost equal.

Agricultural machinery used almost 40% of the energy. Tractors, harvesters and grain dryers were the main energy consumers.

3.4 Use of lime, fertilizers and pesticides

Agricultural lime is widely used because of the acidity of the soil. The large proportion of peatland fields of all arable land increases the use of lime. The average amount of lime used per hectare of arable land annually was 80 kg in 1970, 176 kg in 1980, and 254 kg in 1986.

The use of fertilizers in Finland is minor compared with its use in most European countries. The reason for this is the short growing period resulting in smaller amounts of nutrients used and needed by plants per hectare. Moreover, gardening which requires a lot of plant nutrients is less common in Finland than elsewhere in Europe.

Relatively reliable data on the Finnish fields, which is required for determining the necessary fertilization in cultivation, have been gathered. On special plantations the nutrient content is determined every two or three years, but there are farms whose arable land has never been studied with regard to nutrients.

Almost all farmyard manure is used as fertilizer in the farms which produce it. Around 20% of the nitrogen and calcium and 5% of the phosphorus used for cultivations originates from farmyard manure.

Waste water sludge is not widely used for soil improvement on the fields. Using it without composting or lime stabilization may cause problems of hygiene.

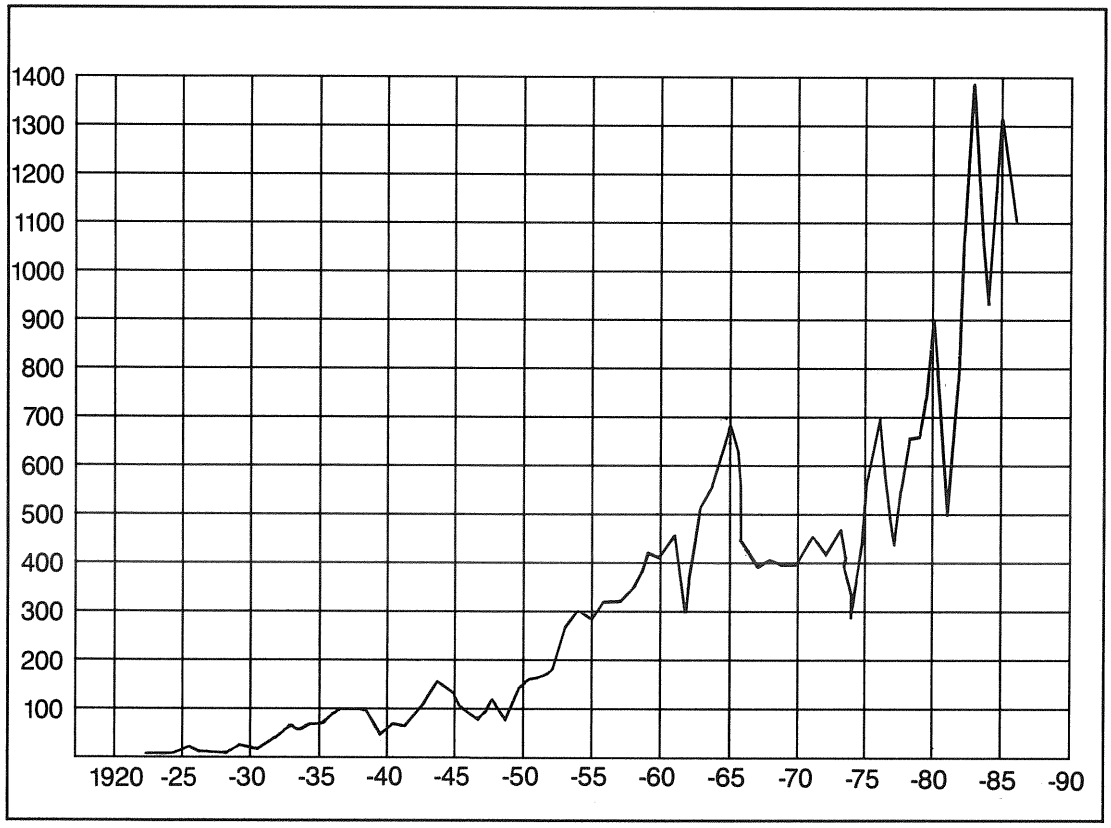

Figure 6. Yearly use of agricultural lime in Finland in 1923-1986 (1000 tons).

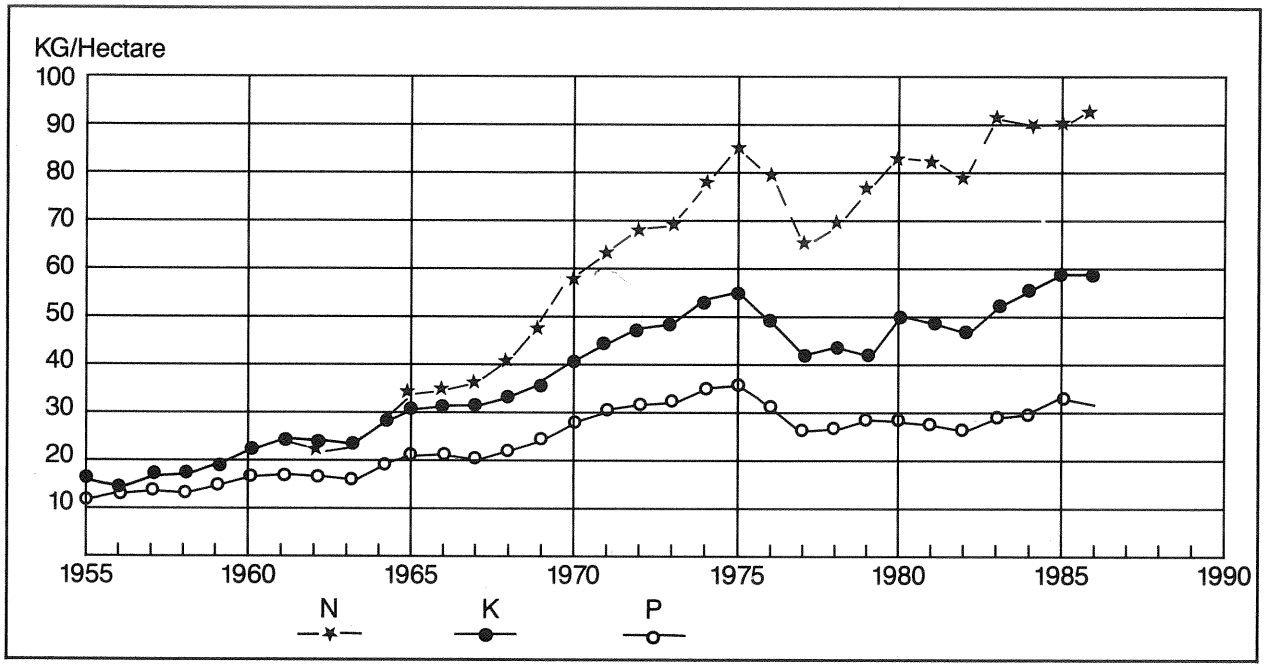

Figure 7. Yearly use of plant nutrients in Finland 1955-1986 (kg/hectare).

A sowing fertilizer spreader, placing the fertilizer together with the seed into the soil and thus decreasing the leaching of fertilizers, has been developed in Finland. This device is commonly used in Europe. Placement fertilization covers over 50% of the area under cultivation. All farms have sowing fertilizer spreaders and fertilizers are washed away to some extent. Leaching of arable land occurs excessively from the clay fields in south-western Finland where there are fewer waters bodies. Most of the leaching occurs from fallow fields which result from production cutbacks in the 1970's.

The use of herbicides in agriculture has increased greatly during recent decades. The approval procedure for pesticides, amended in 1984, aims to prevent damage to the environment.

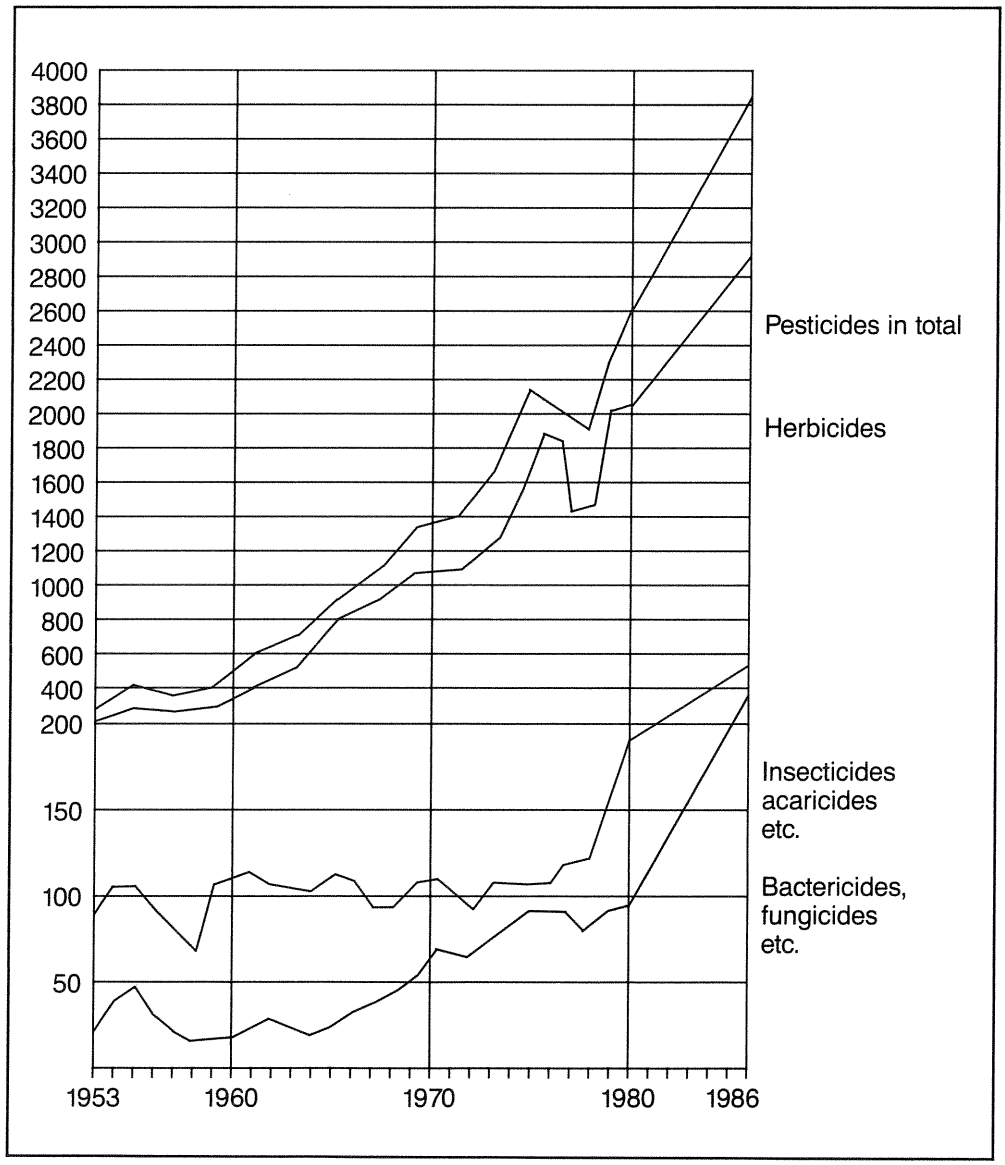

Figure 8. Yearly use of pesticides in Finland in 1953-1986 (tons).

3.5 Cattle breeding

Milk is the most important product of Finnish agriculture and the country has 60,000 milk producers.

Pork production has been transferred to specialized pig farms, mainly in the south and west of the country. Some 9,000 farmers are engaged in pig farming.

Beef, mutton and broilers are mainly produced by farms specialized in these production lines. The farms are mostly situated in southern Finland. The principal area of milk production is the central and northern part of the country.

Table 12. Numbers of cattle in 1970, 1980 and 1986.

In thousands	1970	1980	1986
Horses	90	33	39
Cattle	1873	1738	1567
• of which dairy cows	889	720	607
Sheep	189	106	116
Pigs	1002	1410	1323
• of which sows	104	137	128
• of which fattening pigs	522	839	706
Poultry	8604	9376	8097
• of which hens	4471	6041	5532
• of which broilers	255	900	1060
Minks, kits	3200	4100	3900
Blue foxes, kits	45	1600	2994
Reindeers	165	302	366

The most important environmental effect caused by the use of farmyard manure is the discharge of nutrients into waterbodies. The use of manure as fertilizer is economical, but the lack of appropriate storage space makes it necessary to spread manure even when the ground is frozen. This results in severe drainage of nutrients and can cause damage even to those waterbodies that are used for The water supply. The aim is thus to ban the spreading of liquid manure while the ground is still frozen. Also the leaching of compression liquid from ensilage into waterbodies causes local problems.

3.6 Agricultural research

In 1889 a scientific research institute was established to further the development of agriculture. This institute, now the Agricultural Research Centre, situated in Jokioinen in southern Finland, engages around 130 researchers out of a total of 760 employees. Its field of research covers all agricultural production. The Research Centre has 15 Research Stations all over the country and three special units as well as the units in Jokioinen. One of the tasks of the Research Centre is to produce information on environmental damage caused by agriculture as well as information related to the prevention of this damage. A great deal of agricultural research is done at the Faculty of Agriculture and Forestry University of Helsinki.

3.7 Farmer's supplementary occupations

The average holding is small and many farmers have to find other work to supplement their incomes. Alongside traditional agriculture and livestock-raising, some specialize in market gardening, fishing, fish or fur farming or tourism. Almost every Finnish farm includes some forest, which the farmers often tend themselves.

Fishing remains an important source of livelihood in coastal areas or near lakes. Nearly 2,000 full-time fishermen account for about 75 % of the fresh fish consumed in Finland. There are about 5,000 part-time fishermen, about half of whom fish on inland water bodies. Although there has been a constant decline in the number of fishermen, catches continued to rise until recent years. Fishing is dealt with in greater detail in sub-chapter 17.1.4.

3.7.1 Fish farming

The only fish farmed for human consumption in Finland is rainbow trout (Salmo irideus). Although fish farming remains an important source of income on many mixed farms, most of the rainbow trout produced come from large, privately-owned fish farms, some of which have outputs of as much as 400,000 kilogrammes a year. Such establishments can have several hectares of pools and up to twenty or so employees. Often, too, they produce fry and fingerlings of other ingenious fish species (rainbow trout originating from North America) for stocking purposes and allow people to fish for trout for a fee. Some people farm rainbow trout both for their own consumption and for sale, either in pools or in areas of larger water bodies fenced off with nets.

In 1985 some 335 establishments produced a total of 10 million kilogrammes of fish for human consumption. This had a market value of 158 million finnmarks. About one third of the total produced was exported. About 5 million fry and fingerlings of other fish species, e.g. lake trout (Salmo trutta lacustris) and whitefish (Coregonus lavaretus) were grown for release into natural water bodies in order to boost fish stocks.

Fish farming requires an ample supply of clean water, for which reason most of the farms are in the main lake district (south-eastern Finland)

or in the Kuusamo district further north. Rainbow trout are also grown for the third year of a three-year cycle at sea using net enclosures. Most farming in the sea is carried on off the south-west coast. Here, the diet fed the fish contains a high proportion of baltic herring in addition to dried food.

Fish farms and breeding centres have a major impact on the condition of water bodies. Because these establishments are located on the cleanest water bodies, they cause considerable pollution. Water Courts have recently imposed limits on the fish populations permitted in several establishments and have also ordered the installation of sedimentation equipment. Reducing deleterious effects on water has proved most difficult in cases where farming is done in net enclosures.

3.7.2 Fur farming

Fur farming is an important industry in the economic sense. Finland is the world's biggest exporter of mink pelts, which represented the bulk of the 1,572 million finnmarks' worth of pelts exported in 1986. Other important fur animals include blue fox (blue Alopex lagopus) and doglike raccoon (Nyctereutes procynoides, called "Finnraccoon" in the trade). There are about 6,000 fur farms in all.

Virtually all of the furs produced are exported and export quantities have been growing strongly all the time. The total fox population is 3.4 million in 1986, and the mink population 3.9 million. Fox pelts bring in about 60 % of revenues and mink about 40 %. Finnraccoon and polecat (fitch, Mustela putorius) pelts are produced on a smaller scale.

The main environmental impacts of fur farms are water pollution and smell. In addition to this, escaped mink have proliferated in the wild and affected populations of indigenous fauna in many areas. The fact that farms are now inspected by the authorities responsible for water pollution control and the development of antipollution equipment has markedly lessened their impact on water bodies. In particular, arrangements to channel rainwater correctly have reduced the amounts of nutrients leached from fur farms into rivers and lakes. In order to reduce smell nuisances, regulations stipulating the minimum distance between a fur farm and its neighbours have been imposed.

Fences are now being built around fur farms. This has the dual purpose of preventing escapes and keeping out wild animals and the diseases they carry.

3.7.3 Farm holidays

Approximately 2,000 farmers supplement their incomes by providing board and lodging for tourists or renting out summer cottages. This form of tourism became increasingly popular towards the end of the 1970s. More than 150,000 people spent at least part of their holidays on farms in 1986.

There are about 10,000 summer cottages for rent, virtually all of them on sea- or lakeside sites. 4,000 of them are included in organized booking schemes. Slightly more than half of the 277,000 overnight stays

were by Finnish guests. Of the total number of overnight stays by foreigners, Germans accounted for 75 %, Swiss for 15 % and Swedes for 9 %.

3.7.4 Beekeeping

There are currently about 5,000 apiarists in Finland, who keep a total of about 45,000 colonies, two-thirds of them in the four southernmost provinces. 15 % of apiarists keep more than 20 hives each and between them own half of the national total. Apiculture has grown strongly since the beginning of the present decade and bees are being used more and more to pollinate field crops, especially oleiferous plants. Honey production has been about 1 million kilogrammes per year since the beginning of the decade. This is a very high level and is largely attributable to favourable weather conditions. For the past decade or so, the country's degree of self-sufficiency in honey production has been about 80%.

Bee diseases, especially varroatosis, have spread in recent years and their impact on colonies is believed to be worsening. This has led to calls for the authorities to impose stricter controls on trade in bees.

4 FORESTS AND SILVICULTURE

4.1 Forests as an environmental factor

232,000 sq. kilometres (76%) of Finland's total land area is wooded, which means that forests are the dominant form of landscape. Even in urban areas parks and sheltering woodland tracts are common environmental components. Forests represent a higher proportion of the land area than in any other OECD country and about 1.5% of them remain in a primeval state. Most forests, however, have been exploited economically to some degree for some centuries, as a result of which forest landscapes vary richly. This variety is added to by the large number of private forest holdings (about 416,000) and their small average size (26 hectares). The small scale on which forests are tended as well as variations in soil types and topography have led to an average forest stand size of only about 1-2 hectares in southern Finland. The unit size is substantially larger in the North, where contiguous clear-felling areas have previously been as large as a thousand hectares. According to the new Guidelines for silviculture in the State forests the greatest allowable clear-cutting area is now 30 hectares at the most.

Finland's forests contain relatively few tree species. The most dominant ones are (scots) pine (Pinus silvestris) and (Norway) spruce (Picea abies) of various ages, mixed with birch (Betula verrucosa and Betula pubescens), aspen (Populus tremula) and grey alder (Alnus incana) and black alder (Alnus glutinosa). Only the first three are economically important. There are only few predominantly deciduous forests, mainly in the areas of eastern Finland where slash-and-burn agriculture was most recently practiced as well as in the northern fjell birch (Betula tortuosa) zone on the northernmost fringe of the boreal region. Smallish deciduous glades occur on the Åland Islands and the south-western coastal region. For the past three decades, silviculture has tended to reduce the share of spruce and hardwood species and increase the share of pine. This has been done by favouring pine in regeneration. The seventh National Forestry Inventory showed that half the forests in southern Finland are stands of seedlings or trees in an early stage of growth. Pine is predominant in 70% of the seedling stands. The aim in tending stands of seedlings is to reduce, by mechanical or chemical means, deciduous species which retard the growth of softwood trees. However, these efforts to guide the natural development of species have not succeeded in the way expected, as a consequence of which hardwood species have increased their share in parts of southern Finland in recent decades especially on drained peatland.

Erosion is not a problem on Finnish forest land. The environmental impact of intensive working of about 100,000 hectares a year (drainage, deep ploughing, etc.) is largely confined to changes in the multipurpose usability of the areas in question. By 1985 roughly a quarter (about 5.5 million hectares) of the country's forests had been drained to enhance growth. The resulting hydrological changes have generally benefited both increased forest yields and, after open areas had been afforested, helped flood control as well. By contrast, drainage has allowed bog water, which is acid and rich in humus, to flow in some amounts into lakes and rivers and thus adversely affected their condition. Large quantities of fine, slowly-sedimenting organic material has also been leached from bogs and, especially, arterial drains. Draining forest land proper affects downstream

water bodies relatively little as long as forest fertilization is not increased substantially from its present level. However, efforts are now being made to do just that.

4.2 The development of silviculture

Forests have decisively influenced the economic history of Finland. They have been providing the people of this sparsely inhabited country with furs, tar, building material and fuel for millennia. Tar became an important export item in the 17th century. An export-oriented sawmilling industry based on cheap water power and high-quality softwood grew rapidly in the 19th century, and in the 20th the chemical wood-processing industry used long-fibre softwoods as the basis for its growth into the most powerful force in the country's export sector.

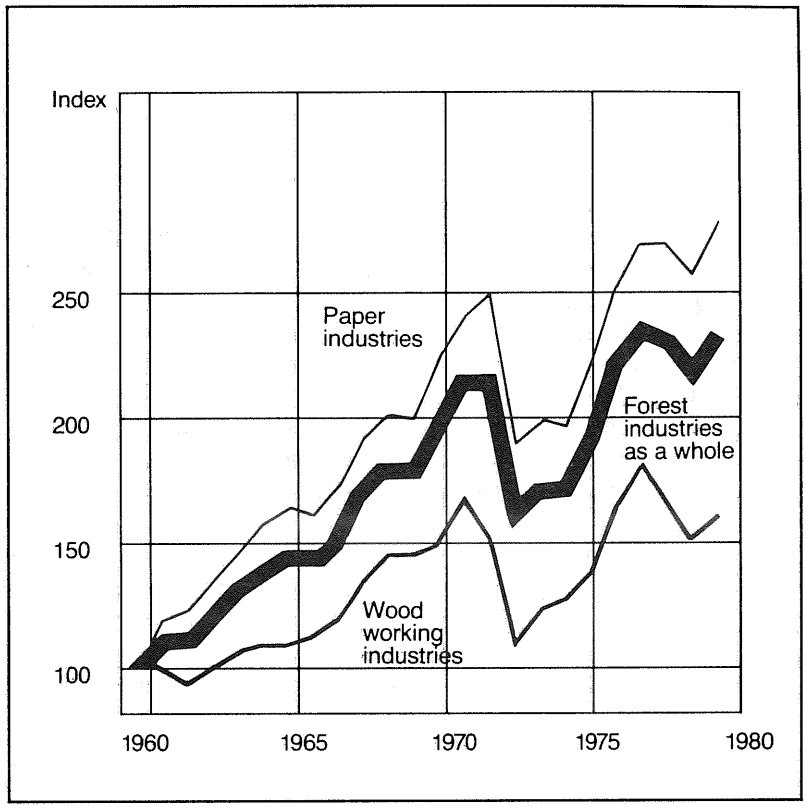

Figure 9. Forest products output since 1960.

In conjunction with a land reform that began in the 18th century, most of the forests passed into private ownership. An active settlement policy, which included tax exemption for life or a specific period, was used to bring formerly uninhabited lands within the sphere of agriculture and forestry. Settlement of this kind continued on a large scale for several decades after the Second World War as well. At the moment, 60% of the country's productive and poorly productive forests are privately-owned, mainly by farmers and their heirs. The State owns 27% and forest industry 7% and the rest is owned by municipalities, parishes etc. The importance of privately-owned forests in wood production is further enhanced by the fact that their growth figures are above average; they

account for 76% of total output. Most of the State forests are in northern Finland.

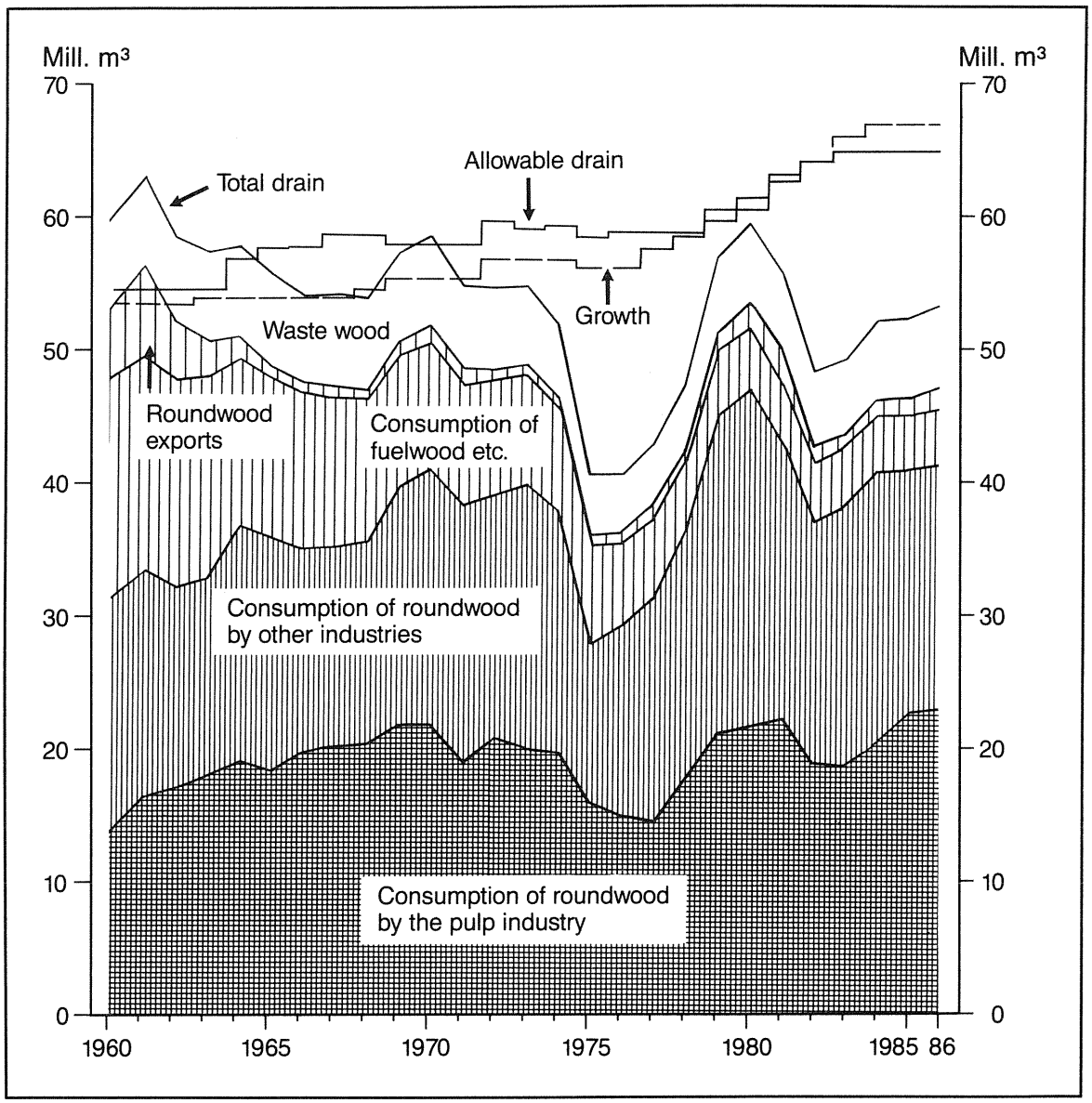

Figure 10. Growth, allowable drain and composition of the total drain from Finland's forests in 1960-86.

Source: The Finnish Forest Research Institute

There is a tradition of silvicultural research about 100 years old in State forests and some company-owned ones. The Forestry Act (1886) was intended to curb wasteful uses of forests, put silviculture on a more systematic basis and create procedures for dealing with forest fires. That notwithstanding, exploitative tar production and selective felling of the largest trees (something that continued until as recently as the 1950s) led to a general deterioration in the condition of the forests. With the purpose of researching the scientific basis of silviculture, the Finnish Forest Research Institute was established in 1917, the year in which Finland became an independent State. To facilitate general exploration and monitoring of forest resources, the world's first nationwide forests inventory was conducted between 1921 and 1924. The Private Forestry Act prohibited the devastation of forests from 1928 onwards and gave regional and municipal forestry boards powers to direct and oversee private forest management.

Regular forests inventories (the first was conducted in 1921-24 and the seventh in 1977-84) and continuous research into use of wood have created the preconditions for systematic forest management based on sustained and increasing yields. Follow-up data have been used as the scientific basis for national and regional forest-use plans. Since the early 1970s District Forestry Boards have been implementing a planning system (based on assessments of stands) for the management of forestry areas. Assessments made on the basis of individual stands can be used to produce the plans needed for silviculture, felling, investments and labour use both on the municipal level and, owner-by-owner, on private farms. The intention is to have completed farm-specific plans covering 90% of the country's privately-owned forests by the end of the century. The immediate goal is to assess 1.1 million hectares of stands a year.

It is up to the individual forest ownerwhether or not to prepare and follow a forest-management plan. Efforts to improve motivation to obtain plans have been made by providing information, through financial support from the State, municipalities and some banks as well as by revising forest taxation to enable owners to deduct the costs they incur in having a plan prepared. By the end of 1985 about 50% of private forests had been included within the sphere of stand-specific forest-management schemes.

The past thirty years have seen an almost complete restructuring of silviculture. Trees are felled almost exclusively with mechanical saws or harvesting machines and transport is also virtually 100% mechanized. Heavy forwarders now transport about 70% of logs from the felling site to the nearest road and virtually all debarking is done at mills. Heavy machines are also used for almost all soil preparation and drainage operations in areas to be replanted. Some of the about 100,000 hectares fertilized each year is done mostly using aircraft. About 80,000 kilometres of permanent forest roads were built between 1950 and 1985, enabling logs to be transported directly by road without interim storage. The construction of those roads has played a decisive role in the development of the road network in sparsely populated areas. They have destroyed wildernesses and accelerated the encroachment of holiday residences on lakeshore areas, but they have also promoted the multiple use of forests.

On the other hand, the heavy trucks used to transport logs have burdened road foundations and surfaces especially during spring time.

The METSÄ (= FOREST) 2000 programme, completed in 1983-84 for the Economic Council (an advisory body connected to the Cabinet Office), sets forth the future development of silviculture. The programme covers such key areas as prospects for increased wood yields, utilization of forests, the development of the forest products industry and improvements in price competitiveness. It also deals with the environmental impacts of forest management and the multiple use of forests. Its aim is to strike a compromise between conservation and economic needs in such a way as to enable forest production to be concentrated in areas which permanently remain under economical silviculture. The need to reach a consensus in conservation matters is considered important, because since the middle of the 1960s a steadily growing proportion of trees suitable for felling have been left in the forests. Indeed, the importance of increasing felling by means of forest-management policy is particularly stressed in the programme.

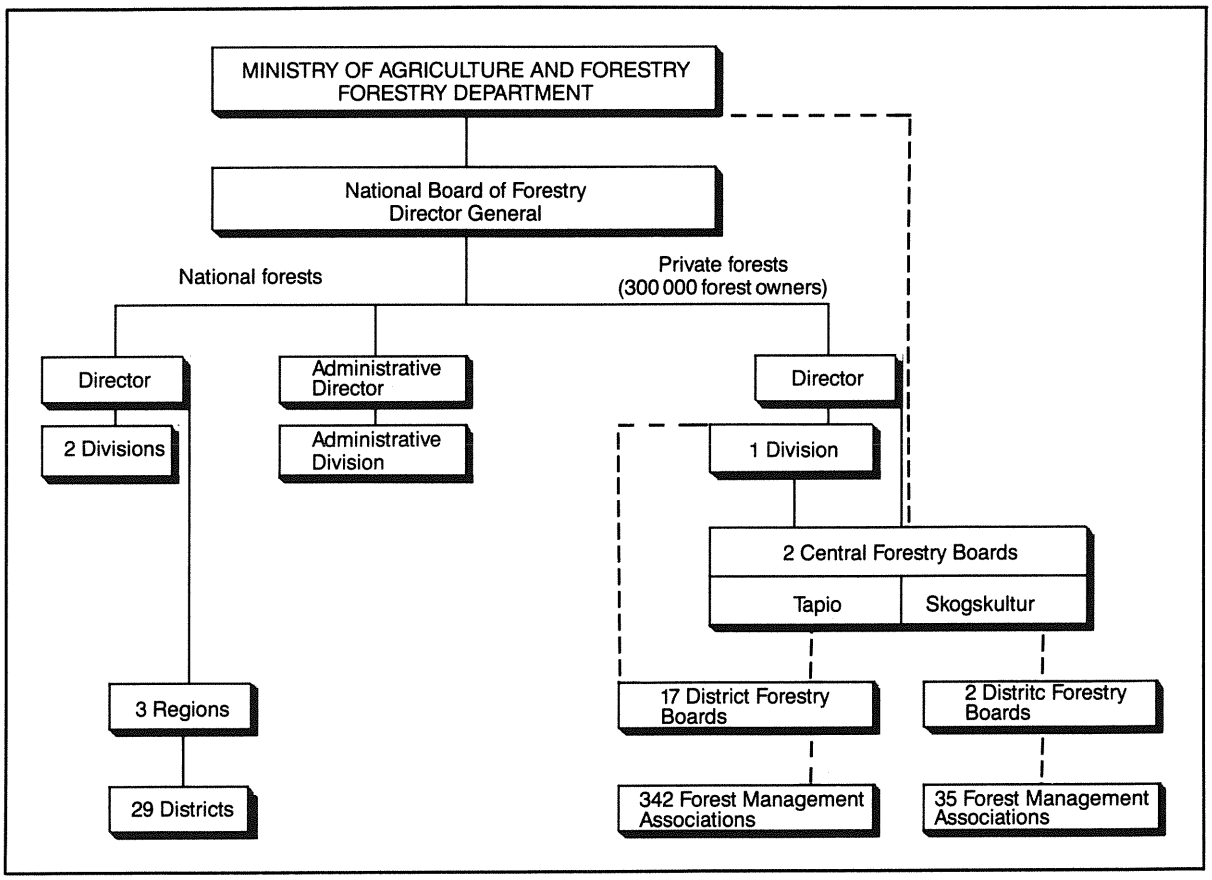

Figure 11. Public forestry administration in Finland.

Forest owners' environmental attitudes have changed to the extent that some of them are unwilling to allow intensive forest-management measures on their holdings. It is expected that environmental attitudes associated with the use of forests will influence the use of productive forests even more in the future. The reasons for this include new legislation limiting forest products companies' land procurement and a gradual change in the structure of private forest owners insofar as more and more of them live in urban centres, do not tend their own forests and are no longer dependent on income from them. Technology has already begun to adapt to this evolution by developing lighter forest machines. Parallel to this, adjustments have also been made in the State's forest management. These include guidelines to the effect that natural regrowth can be relied on more than formerly as a means of reforestation and that deciduous stands are allowed to be grown.

The way in which forests are administered has developed as part of the administrative structure dealing with farm economics. Where private forests are concerned, the idea is that the principle of broad autonomy is applied in the organizational structure. So far, integration of forest and environmental policies is still in its infancy. The main goals here are to plan and manage protected and recreation areas.

4.3 Multiple (multipurpose) use of forests

4.3.1 General

The principle of multiple (multipurpose, manifold) use of forests is applied in Finland mainly in that the same area is used for several different purposes at the same time. In some areas, however, the need to conserve the forest environment has been considered so important that they are used for wood production on only a very limited scale or not at all. So far, the principle of multiple use is not enshrined in forest legislation; the restrictions that exist are based on the Nature Conservation Act, the Protected Forests Act or the Planning and Building Act. However, the multiple-use principle is to a certain extent included in the new Forest Amelioration Act.

Efforts to guide land use in the forestry sector have been made by means of physical plans (regional plans, municipal master plans, building plans, shore plans). The plans contain clauses supporting or limiting forestry. In general, forest owners have not taken a positive attitude to physical planning and in some cases attempts have been made to destroy the scenic or conservation values forming the basis for decisions before the plans have received official sanction. Owing to the purpose of the legislation in question, the only regulations that can be issued in regional physical planning are those that apply to the use of forestry land, but forestry operations themselves can not be guided. The more detailed plans for built-up areas and their environs can include restrictions on forestry, such as norms to protect the landscape, which enable municipal authorities to restrict felling in the area covered by the plan.

The two Central Forestry Boards issued recommendations concerning environmental protection in private forests to the 19 District Forestry

Boards in 1980. The recommendations were updated in 1985. They state that game management, landscape management, the protection of individual nature sites, opportunities to pick berries and water pollution control should be taken into consideration when forestry management plans are being drawn up for individual holdings as well as in other advisory services to forest owners. In practice however, professional foresters generally take the view that good forest management automatically leads to optimal multiple use.

Since the beginning of the 1970s the use of the State forests run by the National Board of Forestry has been based on the application of a special multiple-use classification system. At the beginning of 1985, on the basis of decisions taken by the National Board itself, 0.5% of State forests were classed as primeval areas, 9% as protected and excluded from economic use and 2.5% as various landscape protection areas. No felling at all is done in the primeval areas and some of the protected forests. Those in the landscape protection areas are allowed to grow over longer cycles, regenerate themselves naturally and smaller units are worked at any one time.

Forests in which conservation and recreational use are accorded priority cover a total of about 5 million hectares. 1.9 million hectares of this total is land with an annual yield of at least 1 cubic metre per hectare. Table 13 shows the main use of forest land. The actual wooded area is about 3.1 million hectares greater than the above total, because thin, stunted stands of trees also grow on bogs, rocky land, in the Baltic archipelagoes and in the arctic uplands in Lapland.

Table 13. The main use of forest land at the beginning of the 1980s.

Main use	1000 hectares
Timber production forests	18,190
Nature reserves (existing and planned)	380
Preserved high-latitude and -altitude forests	590
Recreational areas (existing and planned)	140
Recreational homes	110
Farmyard groves	80
Private forests used for recreation	500
Forests used for training and research	110
Total	20,100

The collection of ancillary forest products [berries, mushrooms, lichen, especially reindeer moss (Cladonia)], hunting and, in the northernmost parts of the country, reindeer herding together generate a production value which came to about 800 million marks a year in the early 1980s. This corresponds to about 10% of the "roadside value" of the wood felled each year. The products of wood processing industries and the export earnings from them, together with the knock-on effects of those earnings, make wood production the overwhelmingly most important form of forest use.

Recreational use of forests is based in practice on traditional rights of public access to the natural environment (the right of common access, as it is known in the Nordic countries), which applies to berry and mushroom picking as well as to walking, skiing, temporary camping, etc. That notwithstanding, only 2 - 3% of the berry crop and an even smaller proportion of mushrooms are picked each year, even though incentives exist in the form of, for example, turnover tax exemption on sales of berries. The most common wild berries are the cowberry (lingonberry, Vaccinium vitis-idaea), the bilberry (blueberry, Vaccinium myrtillus) and the cloud-berry (Rubus chamaemorus). The collection of wild produce is dealt with in greater detail in sub-chapter 12.2.

4.3.2 Hunting and game management

Owners of land and water areas have the right to hunt, which they can transfer on lease to other persons or associations. Thus the non-landowning section of the population also is assured the right to hunt, because considerable numbers of landowners have leased their properties to the about 3,500 game clubs in Finland. The lease periods vary from 5 - 25 years. Most hunting is regulated by regional hunting associations, which function separately from the forest-management organizations.

In recent years, about 100,000 marksmen (and -women) as well as drivers took part in elk (Alces alces - moose in American English) shoots arranged by the 3,000 or so elk hunting clubs in Finland. The season begins in the autumn and lasts for about two months. The exact dates on which the season begins and ends as well as the size of the cull are set each year by the Ministry of Agriculture and Forestry. The 9 - 10 million kilogrammes of elk meat produced each year corresponds to about 8% of the country's beef production.

The total number of hunters in Finland was 284,000 in 1984, i.e. 7% of the population aged 16 or over.

A total of 375,000 gallinaceous forest birds were bagged in 1983, along with 600,000 hares, 340,000 fur animals and 69,000 elk. If a population has declined sharply, the species concerned can be placed under a protection order for as long as several years. Game-management and hunting associations have the power to shorten the legally prescribed hunting seasons.

Protective measures and intensive forest rehabilitation have enhanced conditions for elk so much that the population was an estimated 130,000

by the late 1970s. Another important deer species in Finland is the white-tailed deer (Cariacus virginianus), which was introduced from Minnesota in 1934 and has now increased to a strength of about 25,000.

The Game and Fisheries Research Institute is subordinate to the Ministry of Agriculture and Fisheries and collaborates with the State Veterinary Medical Institute in studying diseases that afflict game. The situation in Finland is better than elsewhere in Europe, because game diseases that could be classed as epidemic appear only on a limited scale.

4.3.3 Reindeer husbandry

Reindeer are herded in Lapland and parts of the province of Oulu, in a region totalling about 11.5 million hectares or about one-third of Finland. There is a tendency to keep herds of a size beyond the level which the environment can sustain, especially in the northernmost part of the region. The Reindeer Husbandry Act stipulates that any Finnish citizen resident in the area where reindeer are herded or any herding association can own these animals. There are about 7,000 reindeer owners in all. The average number of adult animals per owner is 18. About 800 households derive most of their income from reindeer husbandry, which also provides about 1,500 households with important supplementary income. It is relatively most important in the areas inhabited by the Sami (lappish) people (i.e. the municipalities of Enontekiö, Inari and Utsjoki and part of Sodankylä) and is a central means of livelihood for this people and a basis for their culture.

The Reindeer Husbandry Act stipulates that grazing rights do not depend on the ownership nor possession of land, but that both private and State lands can be used for reindeer herds. However, reindeer herding associations must ensure that the animals do not harm crops nor young forests. In order to prevent overgrazing, the Government sets (for ten years at a time) the number of reindeer (aged over 1 year) that each herding association can keep in its area.

The most important summer grazing areas for reindeer are bogs, clear-felled areas, riverside pastures and, in the northernmost districts, the slopes of treeless arctic fells. The limiting factor on reindeer husbandry is the availability in sufficient quantities of winter fodder, mainly hair grass (Deschampsia), bogbean (Menyanthes trifoliata) roots and lichens, such as reindeer moss (Cladonia) and horsehair lichen (Alectoria). Hair grass growing on heathlands recently replanted with trees is an important source of nourishment, particularly in early winter. Intensive reforestation of old forest reduces the availability of horsehair lichen in mid- and late winter, because this plant grows only on the branches of older trees. Consequently, it has become increasingly necessary in recent winters to resort to winter feeding and to distribute supplementary and emergency fodder in the terrain. The best growths of lichens are in northernmost Lapland.

Most reindeer are vaccinated against parasites every year. This improved care has meant that their overwintering and calving have generally succeeded well and the summer population has been larger in recent years than it has for decades. However, owners have not adjusted to the

situation by slaughtering commensurately more animals. Thus in recent years the population in part of the herding areas has exceeded the maximum stipulated by the Ministry of Agriculture and Forestry, which has caused the overgrazing on winter pastures. The maximum permitted number of reindeer in winter is 185,000. There were up to 330,000 in summer 1985, of which 100,000 were slaughtered in the autumn and early winter. If this situation persists for long, it will lead to a deterioration in the factors that enable output to be maintained. Despite the cautious slaughtering policy, production of reindeer meat has been at record levels in recent years; in 1986 it was about 3.0 million kilogrammes, worth about 80 million finnmarks.

Mechanical aids are now used on a rather widespread scale in reindeer husbandry. Especially in the northernmost part of Lapland, this is causing profound changes in herding methods and indeed to entire herding communities. In common with other forms of livelihood, the goal set for reindeer husbandry is that a stable level of income be sustained from year to year. In addition to this, reindeer husbandry must be harmonized with the quantitative and qualitative changes caused to grazing areas by other forms of land use (including intensive wood production, habitation, water regulation and tourism).

Statistics on the numbers of reindeer killed by traffic and predators have been compiled since 1956. In recent years about 1,700 have been killed by traffic and an average of 900 by predators. Of those killed by traffic, 82% fell victim to motor vehicles. Most of those accidents happened during the winter season; the worst periods are winters in which the snow is deep and soft, because then reindeer like to use roads when going from one foraging area to another.

Reindeer husbandry and nature conservation have been in harmony with each other in all respects except attitudes to large predators. Although it seems that predators kill fewer reindeer than motor vehicles (even allowing for unexplained cases), wolves - in particular - and wolverines are a problem in several herding areas. Broken down by species, the killings attributed to predators are as follows: wolverines 40%, wolves 30%, bears 20% and others (eagles, lynxes, foxes and arctic foxes, crows) 10%.

4.4 Sustainability of forestry

The Finnish forests' production basis has expanded substantially since the excessive felling of the 1960s. The total forested area has increased by about 1,5 million hectares in the past 25 years. Of this, about 110,000 hectares has been accounted for by afforesting agricultural land, about 200,000 hectares by natural tree growth on land excluded from agricultural production and the rest by natural afforestation of bogs after they had been drained.

The total tree volume, which is now 1,660 million cubic metres, has increased by 11% in the past 20 years. When the increasement in trunk size is taken into consideration, the increase in value has been even greater. The annual growth increment, estimated at 68 million cu. metres in 1985, has increased by 22% in the same period.

Growth in the wood reserve is attributable to several complementary factors. Policy concerning private forests has favoured investments conducive to increasing the area of forest land and improving growth rates. Forest owners' standard of living has improved, which has reduced their dependence on income from timber sales. As a consequence of structural change in the forest-owning segment of the population, the number of owners who have stopped working their forests has increased and holdings have been fragmented into smaller units. Under an agreement between the Bank of Finland and the forest products industry, investments conducive to increased use of wood raw material have since 1970 been guided in a way intended to ensure that the industry's maximum capacity is attuned to a permanently sustainable drain on forest resources. Thus the industry, which is highly sensitive to cyclical fluctuations, has not had the opportunity - even in the short term - to use wood at a level that would substantially jeopardize sustainability, because there is not enough capacity available during booms to use the wood left unused in the forests during recessions. Demand for domestic wood is further reduced by the importation of about 5 million cu. metres each year. For those reasons, an average of about 7 million cu. metres per year of wood that could be harvested without impairing sustainability has been left in the forests each year since 1965.

There have been clear disparities between regions and tree species in the development of the forest balance. In Lapland, especially in the case of private forests, there have been continual instances of excessive fellings which endanger sustainability. Savings (in southern Finland) have mainly applied to spruce and, since a substantial reduction in the use of firewood from the 1970s onwards, to small-diameter hardwood trees. Extensive bog drainage has increased the growth of low-value deciduous species to a point clearly in excess of demand.

4.5 Stability of forests

The stability of forests in Finland is monitored through the National Forest Inventory system, under which a total of 700 permanent test areas were created in 1985 to facilitate observations of a wide variety of types of damage. The Finnish Forest Research Institute's extensive network of permanent test areas is also used in the follow up. The aim is to ascertain cause-and-effect relationships of phenomena through both tests and the use of follow-up material.

4.5.1 The effect of emissions

New-type forest damage (neuartige Waldschäden) of the type reported from central Europe has not, so far, been observed in Finland. Some of the considerable increase (19%) in growth in the past ten years has been speculatively attributed to the fertilizing effect of prolonged nitrogen precipitation and a higher level of carbon dioxide in the air. The Ministry of the Environment and the Ministry of Agriculture and Forestry have launched a joint research project dealing with acidification of the environment and with a budget of about 45 million finnmarks. The project (which is known by its Finnish acronym HAPRO)

began in 1985 and will continue until 1989. Its purpose is to ascertain the impacts of changes in the chemistry of the environment on, among other things, the forest ecosystem and to produce recommendations relating to measures considered necessary to limit deleterious effects.

Acidity levels of pH 4.5 - 5 (and under pH 3 in extreme cases) have been measured in rainwater in southern Finland, whereas the natural level should be pH 5.6. However, only in urban areas have sharp falls in tree growth rates been observed. The complete disappearance of epiphyte lichens has been observed on trees in the environs of sulphur dioxide emission sources and population centres. It is estimated that air pollution is retarding tree growth in an area about 100,000 hectares in extent.

Forests in small areas around factories emitting fluorine compounds were being destroyed until steps were taken to reduce emissions.

The natural ability of the podzolic elements in Finland's meagre, stony soils to act as a buffer against acidification is weak. Lime spreading has not succeeded in eliminating the adverse effects of acidification. In 1984, with the aim of reducing damage, the Government issued regional value guidelines to the effect that the annual average concentration of sulphur dioxide in the air should not exceed 25 µg per cu. metre in areas important from the viewpoints of forestry or nature conservation. The long-term aim for those areas is that national and international measures should lead to a general development ensuring that the amount of sulphur falling on the land or into the water does not exceed 0.5 grammes per sq. metre a year.

The sulphur dioxide concentrations in the forestry areas mentioned above are generally 3 - 15 µg per cu. metre. The highest levels of sulphur precipitation in
forest areas are nowadays about 2 grammes per sq. metre a year.

Air pollution control and energy-policy instruments as well as silvicultural methods are the means used in efforts to limit the damage caused by acidification. The Forest Amelioration Act is being revised to enable State financing to be used for controlled burning of privately-owned forests in order to enhance the soil's ability to act as a buffer against acidification. Guidelines on forest management now favour hardwood species intercropped with softwoods more than formerly and information campaigns are being conducted in an effort to encourage felling and regeneration in old forests whose ability to grow has declined.

4.5.2 The effect of forestry

The intensification of wood production that began in the 1960s has reduced uncertainties connected with the management of natural forests, but has also increased the risks inherent in new investments and the rapid introduction of inadequately tested technology. Forest damage indirectly or directly attributable to forestry is so far confined to a limited area, but if conditions change and become more favourable to the spread of damage, very large areas may be affected.

About 180,000 hectares of forest is thinned each year. The METSÄ (= FOREST) 2000 programme envisages this area being increased 1.6 times in the next ten years, with extensive stands planted since the 1960s reaching the point where they can be thinned for the first time. The purpose of thinning is to increase the quality and value of the final cut and harvest trees otherwise lost by mortality. Nowadays, thinning very rarely causes the destruction of a forest. Such operations are supervised with the aid of a notification procedure; forest owners are required to notify their District Forestry Boards of all thinning or felling within the framework of natural regeneration. Spot checks are conducted on the basis of notifications.

Felling to facilitate regeneration is conducted on about 190,000 hectares each year; about 135,000 hectares of this is clear-felling. According to the Private Forestry Act, the forest owner is in charge of forest renewing and district forestry boards supervise artificial regeneration by a special permission procedure. In addition to this, the owner must give the district forestry board a surety of a certain size, covering the costs of reforestation (usually by planting). The money is used to replant the area in question, unless the owner himself takes care of it. This system has meant that reforestation has mainly taken place in accordance with the guidelines. However, there have been some problems in the early development of seedlings, and inspections 5 - 7 years after planting have revealed that only about 30-60% of the regeneration areas have stabilized themselves satisfactorily. This is mainly due to negligent care in the very early stage, with the result that some of the young trees have been suffocated by grass in clear-felled areas and low-quality deciduous varieties have caused difficulties, especially in pine plantations.

In 1985, 3,7 million hectares (15%) of Finland's forests were plantations. The state of health of those and of young forests in general (which in southern Finland account for half of all existing forests) are the focus of special attention in forest inventories. According to the latest inventory statistics, pine-dominated young forests have not suffered remarkably of damages. Young pine forests unsuitable for development represented only 1% of their total area, whereas the corresponding percentage in planted spruce forests was 2%, in naturally developed spruce forests 7%. It was 27% in planted birch forests and 52% in naturally regenerated ones. The need for supplementary planting corresponds to the total area of forest planted in a year. Failed plantations were most common in Lapland (7% of the area planted).

Plantations have been found particularly unstable on marginal forestry land, especially land formerly used for agriculture, low-nutrient drained bogs and in high-altitude and high-latitude areas. In those areas, nutrient imbalances in the soil, poor physical properties in the land and extreme climatic conditions weaken tree seedlings' chances of thriving. Forest planting on at least 10% formerly agricultural land has failed. Snow damage is detected in planted pine forests at lower altitudes than in natural forests. Seed material has not always been genetically suitable, because possible climatic differences between its area of origin and the area in which it is used has not been taken adequately into account in the past. There is now a greater awareness of the need to choose genetic material more precisely.

Seedlings are produced mainly in nurseries belonging to the Central and District Forestry Boards and the National Board of Forestry. Nurseries cover a total area of 1100 hectares. Various kinds of growth disturbances have plagued seedlings in open nurseries in recent years. In worst cases these disturbances were noted in over 90% of one-year-old pine seedlings in 1983. By contrast, most spruce and birch seedlings were healthy. The nurseries weed out seedlings that have been found incapable of growing before they are sent for re-planting in the forests. Thus most of the 246 million seedlings delivered in 1984 were healthy and began growing normally in the forests. Owing to the unfavourable circumstances and to difficulty of determining seedling diseases, about 2 million pine seedlings or one per cent of the total delivery infected with dieback and canker fungus (Scleroderris lagerberqii) were sent to the forests in 1985 and died after they had been planted. Efforts are being made to improve the state of seedlings' health by, among other things, increasing the relative share of pot-seedlings which now account for more than half the total number of seedlings produced. Responsibility for supervising nurseries is vested in the National Board of Forestry. Supervision and research in the sphere of seedlings production have been stepped up in recent years.

The increased transport of wood by road, the fact that felling is now spread more evenly throughout the whole year and the transfer of debarking to mills have increased the amount of undebarked wood stored in forests in the summer. This has led to an increase in the number of bark beetles (Scolytidae), which often harm the growing trees around woodpiles. In the environs of central stores belonging to forest products industry mills, these pests have caused permanent damage to areas hundreds of hectares in extent. Pesticides have been used in an effort to combat them, but in the areas around some of the central stores this has caused serious soil pollution. The Ministry of Agriculture and Forestry is currently studying the need for new legislation to limit the damage caused by wood storage in forests.

Mechanization of wood harvesting and summertime harvesting have increased the amount of damage to the bark, branches and roots of standing trees. Studies indicate that the average damage rate is 2% of trunks, with the highest level observed 9%. More than half the injuries are to trunks. Damaged trees easily become havens for various colonies of pest insects, fungi and bacteria, which eventually retard the tree's growth and even kill it altogether. Root-rot disease (caused by the polypore Fomus annosus) has infected 15% of damaged trees in the coastal area of southern Finland. However, forest harvester manufacturers are developing smaller and lighter designs and forest owners are being advised to avoid harvesting spruce in summer.

In some areas, tracked tractors and deep-cutting ploughs have been used to work land intended for regeneration. Most of this intensive ploughing has been done in northern Finland, where climatic and soil conditions have required that land, especially fine soils and waterlogged heaths, be processed before trees are planted on it. All in all, about 250,000 hectares of forest land has been ploughed in the province of Lapland. The cost of the heavy equipment involved has required clear-felling of large contiguous areas and the work has followed an inflexible pattern, in which the special requirements of various topographical features have

not always been taken adequately into account. Thus ploughing has altered the landscape considerably in some areas and reduced recreational values. It has also harmed reindeer herding.

Ploughing scars heal in 10 - 20 years in southern Finland and in an estimated 30 - 50 years in northern Finland. The effects of deep ploughing have been widely criticized in the press. Researchers hold differing views on the matter. That is why the area worked in this way is gradually reducing and more attention is being paid to local conditions in planning the work.

About 1.2 million hectares of forest was fertilized in 1975-84. Nitrogen fertilizer was mainly used in mature forests on mineral land and phosphorus-potash compounds on peaty soils. For the most part, fertilization has enhanced forest growth. Berry crops have also increased and game has benefited from this. The fertilizing of ditched bogs from the air has increased runoff of nutrients into drains and water bodies. In areas of southern Finland affected by root-attacking fungus damaged due to decay has been found to have increased after fertilization with nitrogen. The National Board of Forestry has revised its guidelines concerning nitrogen application in northern Finland, because this has been found to increase the risk of frost damage and dieback canker fungus of pine. Financing under the Forest Amelioration Act is available only for fertilizing those areas in which the sum of the daily degree of temperature is at least 800°C d.d.

Whole-tree harvesting, in which not only the trunk but also the branches and the green biomass are removed entirely or in part from the forest, has been conducted on a trial basis. This has also meant the removal from the forest of considerable quantities of nutrients; in the case of thinning 20 - 40 kg of nitrogen per hectare from pine stands and 60 - 90 kg from spruce stands. It has been estimated that such an outfall would have an adverse effect on the remaining trees' growth rate and increase their susceptability to fungal diseases. It has also noticed that damage caused by pine sawflies (Diprion pini) increases on dry, bleak mineral soils. The loss of nutrients requires artificial fertilization in order to sustain growth. On dry heathlands, efficient collection of biomass reduces the soil's humus reserves and thus also adversely affects its water balance.

Basic fertilization and drainage of peatlands has made forests grow well on several hundreds of thousands of hectares of formerly treeless or only thinly wooded bogs. Stands of young trees are now growing vigorously on most of this area, but unless the drains are re-dug and fertilization repeated within 25 - 30 years of planting, the trees' growth will slow down and their condition deteriorate so much that their sensibility to frost damage and dieback and canker fungus of pines can increase. The latter has been detected in young pines both on boggy and mineral soils on several tens of thousands of hectares both on bogs and mineral soils in the past five years. Fungal infections have spread from affected spots to young pine stands on surrounding heathlands. In the North Satakunta region of south-west Finland and North Häme in the central part of the country, felling has had to be resorted to in an effort to rehabilitate affected forests.

Ash fertilization has proved beneficial on peatlands, but economic technology for spreading ash has not yet been properly developed. Efforts are being made to intensify fertilization and drain maintenance by providing State financing under the Forest Amelioration Act and with the aid of new tax legislation which improves the deductibility of costs incurred for private forest owners. A precondition for costs being accepted as tax-deductible is that fertilization and drainage operations conform to good silvicultural practices and environmental protection requirements, as stipulated by the Central Forestry Board for the area in question.

Herbicides are not used to a great extent in forestry at the moment. A few tens of thousands of hectares are sprayed from the ground each year. Aircraft have been used for spraying in some exceptional cases only, because a permit from the local Municipal Board is required for this. The most common herbicide is phenoxic acid (MCPA). Harmful residual levels have not been detected, but the use of herbicides has been considered to reduce the multiple-use value of forests.

Foreign tree species have been tried on only a limited scale. Lodgepole pines (Pinus conforta) and larch (Larix) have been planted on a few thousand hectares. Stands representing superior domestic genetic stock have been registered and placed under protection orders.

4.5.3 Natural disasters

Fires formerly had a strong regulative effect on the forest environment. In Lapland, for example, several hundred sq. kilometres of forest were destroyed by fire each year in the 19th century. Improved preparedness to combat fires and the abandonment since the 1960s of controlled fires for silvicultural purposes have substantially reduced the scale of forest fires. Although 717 fires were reported in 1986, the total area affected was only 360 hectares. On more than two-thirds of cases, the fires were caused by human activities. Small patrol aircraft, watchtowers and passenger aircraft on domestic flights are used to keep a lookout for fires in summer. An improved road network has meant that firefighting operations succeed rapidly. In northern Finland the reduced incidence of fires is believed to have reduced the productive capacity of some forest types, because in the humid climate there undecomposed humus material constantly accumulates on the ground, detracting from the forests' ability to regenerate themselves naturally.

In economic terms, the most important natural disasters in recent years have been storms, which have affected some part or other of the country almost every year, a total of more than 300,000 hectares in the past decade. More than 80% of the forest damage in respect of which insurance companies have paid compensation since 1975 has been caused by storms. Several million cu. metres of wood has been damaged in this period, but most of the damaged wood has been successfully collected. In order to speed the renewal of the areas, the State has provided forest owners with financing under the Forest Amelioration Act. Likewise, laws intended to reduce the taxes payable by persons whose forests have been damaged have been enacted. In order to limit damage by pests and fungi

in the wake of storm damage, tax concessions have been granted, especially to those owners who remove the felled trees in the year following the damage at the latest.

Clear-felling and natural regeneration with the aid of thin stands of seedlings have increased the risk of wind damage. The fact that seed trees have been felled by winds of only a little over 10 metres per second has made natural reforestation less economical.

More open spaces and young hardwood stands have improved the habitat for elk. At the same time as the elk population has been multiplied by five since the beginning of the 1970s (to about 130,000), the damage done by those animals to young pines and birch seedlings has increased.

The population densities recommended by game management experts (3 to 4 per thousand hectares in southern Finland and 2 at the most on the same area in northern Finland) are nowadays exceeded in some areas. Elk often continually damage the same areas in which forest regeneration is not succeeding. Census data indicate that nearly 60,000 hectares of southern Finland has been damaged by elk, and this damage has been estimated to lessen forest yields by nearly 100,000 cu. metres per year. If the population density remains at its present level, the amount of damage will increase further. The yearly damaged area has ben estimated to bee about 2,500 hectares and the value of damages around 8 million finnmarks. There can, however, be severe underestimations since information on many occurrences never reaches the officials. An adequate level of hunting and, to some extent, the use of chemical repellents are the means by which an effort is being made to reduce elk damage.

Moles have damaged forest plantations covering thousands of hectares, especially on peaty, formerly agricultural land in northern Finland, and no effective means of warding them off has yet been found. The bordered white moth (Bupalus piniarius) and the European pine sawfly (Neodiprion sertifer) have caused damage in the pine areas of central Finland several years running since the beginning of the 1980s. Areas of concentrated damage have been several thousand hectares in extent. Viruses and chemicals have been used against these pests.

A profusion of autumnal moths (Oporinia autumnata) along the northern forest limit in the late 1970s destroyed a considerable part of the fjell birch zone, as a consequence of which reindeer husbandry also suffered considerably. Human action proved ineffectual against this damage in the ecologically sensitive northern region and the forest line shifted over an extensive area.

Special legislation with the purpose of protecting threatened forest areas was enacted in 1922. Under the powers conferred by this, the Protected Forests Act, the Government can order limits on forest use not only along the northernmost limit of forests, but also in areas threatened by wind, landslides or erosion. In practice, the Act has been applied only to the zone along the northern limit of softwoods, where a specially protected area called the Northern Protection Forest Zone was created in 1939 and marginal conditions are required to be given special consideration in forest management. The National Board of Forestry has issued guidelines dealing with the management of protected high-altitude

forests to the south of the zone. A particular problem in those areas is ensuring the natural regeneration of unique, genetically important, spruce-dominated old forests, something to which no indisputably valid solution has as yet been found. Some 1.6 million hectares of the protected high-latitude and -altitude forests' total area of about 3.3 million hectares is now actually forested, of which about 360,000 hectares is under forest management. It has been proposed in the FOREST 2000 long-range programme that urgent steps be taken to accelerate the regeneration of old spruce stands by methods appropriate to the conditions concerned.

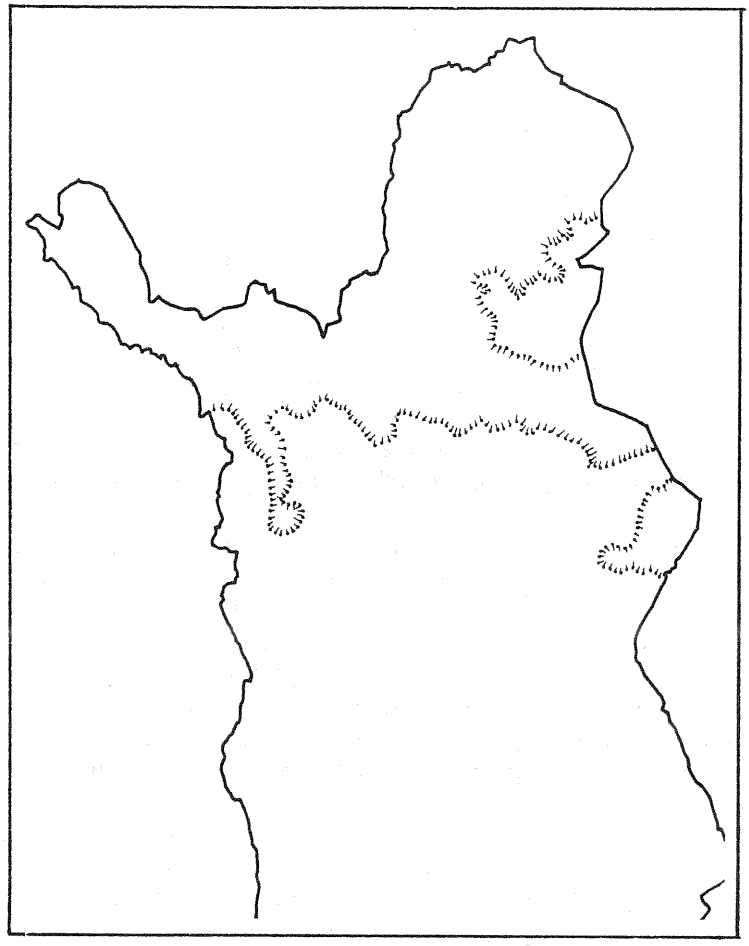

Figure 12. Boundary of the Northern Protection Forest Zone.

In forest management, the knock-on effects of damage to forest and the spread of this damage are prevented by removing damaged trees from the forests. Since nowadays only about half of all forest owners live on their land, they often do not learn of damage soon enough. When only individual trees have been damaged, they have generally been collected over a span of several decades in conjunction with normal felling done in the areas affected. Fungal and insect damage in individual stands and

occasional storm damage generally require rapid action, for the promotion of which forestry advisory organizations are planning procedures. So far, however, there is no clear follow-up system for locating such damage, providing information about it and following-up remedial measures.

4.6 Forest amelioration programmes

Investments aimed at improving forest yields are voluntary for private forest owners. The annual State budget allocates funds for this purpose, following the rules specified in the Forest Amelioration Act. Forest owners may apply for low-interest loans and direct financial support.

Several wood production programmes were introduced in the 1960s. These programmes, which were mainly planned jointly by representatives of the forest products industry and of forest owners, were intended to intensify the development of forestry, taking into account resources and wood production capacity as well as development prospects for the industry.

The following wood-production programmes (most of the names are Finnish acronyms) have been implemented in recent years:

1. HKLN (1962) for the years 1963-1972
2. Teho (1962) for the years 1963-1972
3. Teho II (1964) for the years 1964-1975
4. MERA (1965) for the years 1965-1970
5. MERA II (1966) for the years 1966-1971
6. MERA III (1969) for the years 1970-1975
7. The Economic Council's Programme (1969) for the years 1970-2015
8. Several wood-production programmes produced by the advisory Forest Management Committee
9. METSÄ (= FOREST) 2000 (1984) for the years 1985-2000

Those programmes have defined annual and long-term objectives for silvicultural measures and amelioration. These measures were aimed at increasing the production capacity of unproductive and low-productive soils, mainly peatlands, rehabilitating degenerated forests and intensifying normal timber production. In particular the MERA programmes, the third supported by the World Bank, resulted in vigorous growth in silviculture and forest-based industry. However, environmental aspects were widely neglected until they began to be taken into consideration as a condition for funding measures implemented with the aid of World Bank financing. Forest improvement funds may no longer be used for areas of value from the viewpoint of environmental protection. Consequently, professional foresters are expected to contact the environmental protection authorities if necessary when they are planning projects.

Drainage has been the most important method of forest amelioration in the past 25 years. Approximately half of the total peatland area has been drained. In the 5,5 million hectares or so that have been affected, environmental factors affecting both the land and its tree cover have been substantially altered, something that can be seen in, among other things, the composition of its flora and bird life. The importance of bogs in the production of certain valuable wild berries (cloudberry, Rubus chamaemorus and cranberry, Vaccinium oxycoccus) has declined, but drainage has created good preconditions for a growing elk population. The aim for the future is to try to safeguard the benefits accruing from drainage by expanding maintenance work; this will be done by making the work eligible for forest amelioration funds and allowing costs to be deducted from taxable income. The preconditions for tax deductibility will also include a provision that drain maintenance be implemented in a manner appropriate from the viewpoint of environmental protection.

In the past ten years a considerable share of forest amelioration funds has been used for roads capable of accommodating vehicular traffic. Planning guidelines in relation to those roads have also been revised to ensure that scenic values are taken into account more than formerly. In 1985 about one-third of the annual total of approximately 300 million finnmarks allocated for State funding of forest amelioration was spent on road building.

4.7 Forestry education and information

Higher education in forestry began in 1862. Since 1924 there has been a Faculty of Agriculture and Forestry at the University of Helsinki. In 1982 forestry education was also started at the University of Joensuu. The number of new students enrolling for studies leading to a Master of Science (Forestry) degree has varied from 80 to 100 in recent years.

The National Board of Vocational Education is subordinated to the Ministry of Education. The Board directs and supervises a total of 30 educational establishments serving forestry and the forest products industry. Several study lines are usually offered by each school. One intermediate-level institute specializes in training forest management engineers to multiple-use tasks.

There are several magazines or periodic publications dealing with questions related to forestry. The largest of them, magazine Metsälehti (Forest Magazine), which is published by the Central Forestry Board Tapio and circulated to professional foresters and private forest owners, and several other monthly publications dealing with this sector extensively cover environmental problems connected with forest management.

4.8 Forestry research

Forestry-related research is done by universities, institutes run under the auspices of the Ministry of Agriculture and Forestry and some private organizations. As the universities' annual budgets do not provide funds for research, it must be financed from other sources. The main

sponsors are the Research Council for Agriculture and Forestry, a body associated with the Academy of Finland, the Foundation for Research of Natural Resources in Finland and the Finnish Cultural Foundation.

The Forest Research Institute has about 1,000 employees, of whom about 200 have university degrees. About half of the total personnel strength are posted at research stations in various parts of the country. Besides its research task, which includes all the important sectors of forestry, the institute is charged with official duties in the fields of forest statistics, forest taxation, inspection of pesticides and registration of regeneration material. The effects of airborne pollution on the forests is one of the focal areas of forestry research in the 1980s.

5 ENERGY MANAGEMENT

5.1 Administration of the Energy Sector

The Ministry of Trade and Industry, its Energy Department in particular, co-ordinates and develops the management of energy matters within the State administration, in which the work involved is divided between several different authorities. Liaison between authorities occurs in conjunction with work like budgetary and operational planning as well as in dealing with practical matters.

The public authorities implement energy policy in a variety of ways, e.g. by financing facilities for the production and use of energy and related research. The main forms of financing are grants, interest subsidies or other loans on softer-than-normal terms. As the central energy authority, the Ministry's Energy Department co-ordinates public energy financing in general in order to ensure that it corresponds to the requirements of Finland's national energy policy.

The Energy Policy Council, which deals with general questions, and the Electricity Supply Committee, which plans electricity supplies, are two permanent advisory bodies that work under the auspices of the Ministry. Questions concerning the nuclear energy sphere are dealt with in the same way by the Atomic Energy Advisory Committee. A working party that co-ordinates co-operation between the energy-management sector and the authorities responsible for environmental protection has also been working since 1974. Its main function now is liaison between the Ministry of Trade and Industry and the Ministry of the Environment in relation to the environmental impacts of power lines.

With certain exceptions, the new Electricity Act, which entered into force at the beginning of 1980, makes permits a requirement for electricity utilities, power stations and transmission lines. These permits are issued by the Ministry of Trade and Industry and, in some cases, the Government. The Act also makes planning of electricity supplies compulsory. An outline national electricity supply plan, which requires the Government's sanction, must be drawn up each year. On the regional level, committees must draft annual supply plans, which are submitted to the Ministry of Trade and Industry for approval. For regional planning purposes, the country is divided into twenty planning regions. A sanctioned regional electricity supply plan constitutes a building plan for the power stations and transmission facilities marked on it.

The task of the Ministry of Trade and Industry is to act, in accordance with current legislation, as the supreme supervisory authority in the nuclear energy sphere. This involves both safety questions concerning the use of nuclear energy - with the exception of matters directly concerning radiation protection - and attending to the obligations which Finland has assumed by signing international conventions.

The Ministry has developed regional energy planning methods and a planning system for the intermediate level between the national and municipal levels. In recent years, with the support of State grants, energy-management plans have been completed for nearly all of the

country's regional physical planning areas (see chapter 15.2). It is expected that within a few years regional energy planning will have consolidated its position as part of the normal activities of Provincial Offices and Regional Planning Associations.

Table 14. Public financing in the energy sector 1984 - 1987 (includes the financing by the Ministries of Trade and Industry, Labour, the Environment, and Agriculture and Forestry as well National Board of Housing and National Board of Agriculture).

	1984	1985	1986[1)]	1987[1)]
		Million FIM		
Investments for energy saving and facilities	78	58	103	150
Production of indigenous fuels	24	37	29	35
Improving the energy efficiency of houses and farmyard buildings	100	84	81	21
Research	86	88	97	112
Total	288	267	310	318

1) Estimates from the State budget

Public-sector organizational structures in the sphere of energy are shown in greater detail in figure 13.

Other bodies responsible for Finland's electricity supply are energy companies, industry and municipal energy authorities. Energy organizations belonging to business interests and the local-authority sector co-operate closely with the public authorities in planning energy management.

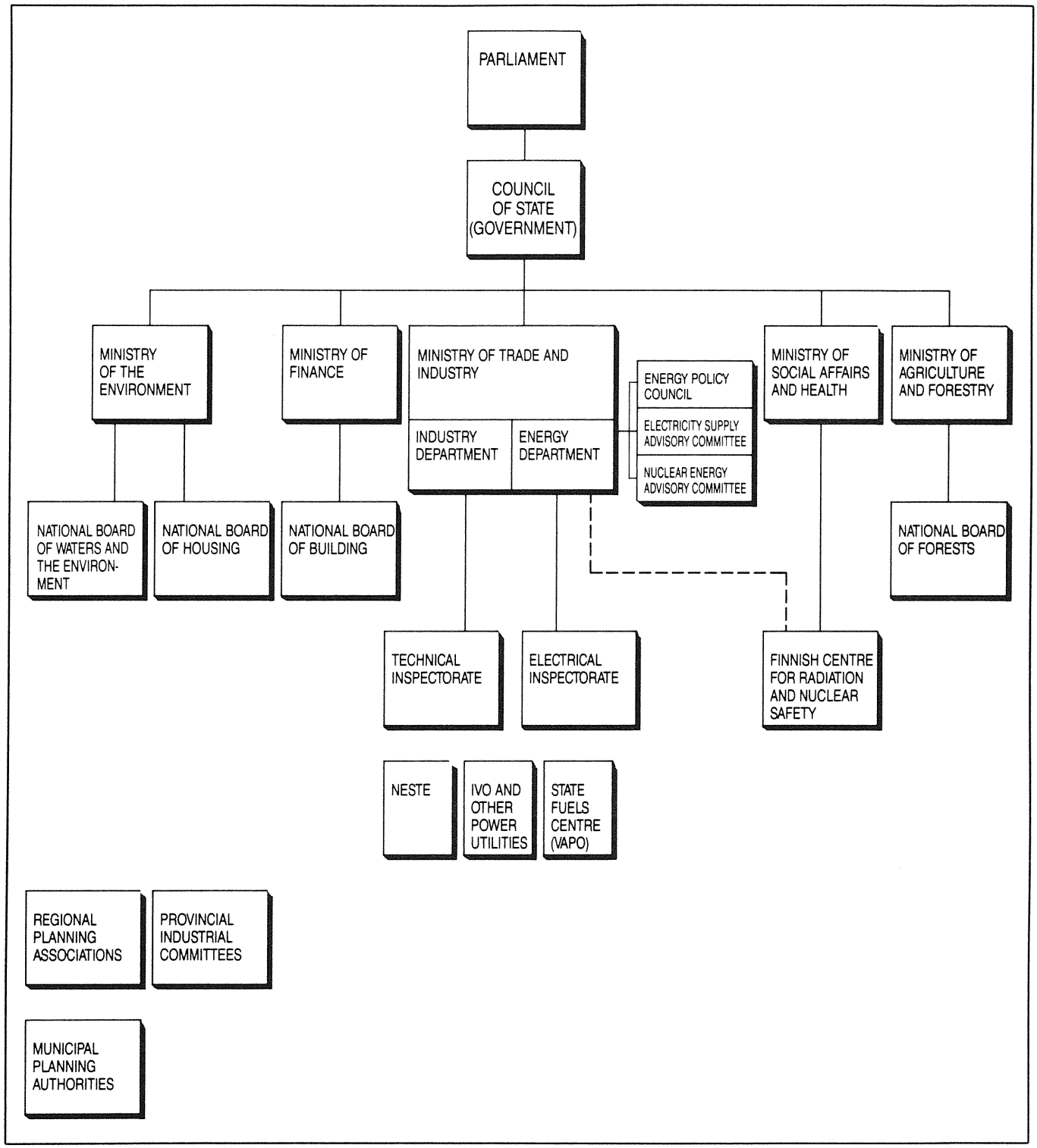

Figure 13. Energy-sector authorities and state-owned energy companies.

5.2 Energy policy goals

A long-range perspective is the characteristic feature of Finnish energy policy goals, because decisions taken in this sphere are long-lasting or permanent in their effects. The structure of energy management changes slowly, and once decisions have been made they continue to affect the basic structures of society for decades. The main goals of energy policy remain within a rational framework in the national economic sense, i.e.:

- safeguarding energy supplies in accordance with the goals set in relation to national security and economic operation;
- economical and efficient use of energy and the avoidance of waste;
- raising the degree of self-sufficiency by increasing the share of indigenous fuel sources and other production inputs.

The most central categories of measures undertaken by the public authorities are financing energy investments, taxing and pricing energy, promoting research and development, information, legislation and licensing procedures as well as inspection and supervision.

Environmental aspects have been taken into consideration in energy policy to a clearly increasing extent in recent times. The costs of environmental protection have begun to be allowed for in full in both direct and indirect expenditure. The goal of the environmental protection measures included in energy policy is to improve the state of the environment and reduce health hazards, among other things with the aid of measures intended to reduce acid precipitation.

5.3 Energy consumption and production in Finland

Energy consumption in Finland totalled 27.7 Mtoe in 1986 and has grown at an annual average rate of about 3% in the past couple of years. Consumption grew by 7.4 Mtoe (71%) in the 1960s and 6.5 Mtoe (34%) in the 1970s. The degree of energy self-sufficiency was 59% in 1959, after which it declined slowly until the early 1980s, when it stood at slightly over 30%. Strong growth in the use of peat has helped keep the self-sufficiency level at around one third. In 1986, peat accounted for over 4% of primary energy needs and over 13% of indigenous energy production.

Most of the imported energy consumed in Finland is derived from oil. However, oil's share of the total energy supply has been declining since 1973, when it was 56% compared with about 35% in 1986. In particular, consumption of heating oil has fallen sharply. Oil's share has been eaten into by nuclear energy, coal, natural gas and peat.

Finland's first nuclear power station began generating electricity in 1977. Nuclear energy represented 16% of total energy consumption in 1986 and has retained approximately the same share in recent years. This is one of the highest proportions in the world.

Coal plays a considerable role among foreign energy sources and its share of the national supply rose steadily throughout the 1970s. Its relative share has declined somewhat since the beginning of the present decade, but has at times risen again, sometimes markedly. In 1983-84 it was about 9%, in 1986 about 12%. This growth was accounted for by both industrial users and district-heating and power stations.

Natural gas accounts for 4% of total energy consumption, but its share has been growing quite rapidly in very recent times. It is being used more extensively both in industry and by power stations.

5.4 Breakdown of energy consumption

Data concerning the breakdown of energy consumption in Finland are available with respect to industry, transport, heating and electricity generation. The latter category is considered to include condensing power stations, gas turbine power stations, hydroelectric power, nuclear energy and net imports of electricity.

The increase in total primary energy consumption in the 1960s and 1970s was largely due to growth in separate generation of electricity. Whereas this accounted for about 19% of our primary energy in the early 1960s, the share had grown to 26% by the end of the 1970s. It has risen further since the beginning of the 1980s, reaching 35% in recent years. Industry remained clearly the largest consumer, accounting for more than half the national electricity consumption total. Electricity for space heating also increased its relative share of the total. In 1986, hydro power and nuclear energy accounted for about 60% of the total electricity supply between them. Counter-pressure facilities operated by cities and industry provided more than a fifth of the electricity supply. The share of conventional condensing power stations declined from more than a quarter of the total supply in 1980 to only a few percent in 1984-1986. Imports provided 12% of the total electricity supply.

Depending on the way in which industry develops, there is an energy-management construction potential of about 1,000 MW in the sphere of cogeneration of electricity and heat. However, there are several obstacles to the realization of this potential, including new wholesale electricity tariffs. Corporate-economic construction potential may not exceed 300 - 500 MW.

Transport has recently increased both its absolute consumption and its relative share of overall primary energy consumption. Growth in the quantity of energy produced and consumed by industry itself stopped in the 1970s and its share of total consumption has been gradually declining.

The amount of energy used for space-heating properties has declined, whereas the share of district heat has risen strongly. Thus a changeover to district heating and improvements to properties' energy economy have reduced space heating's share of total consumption.

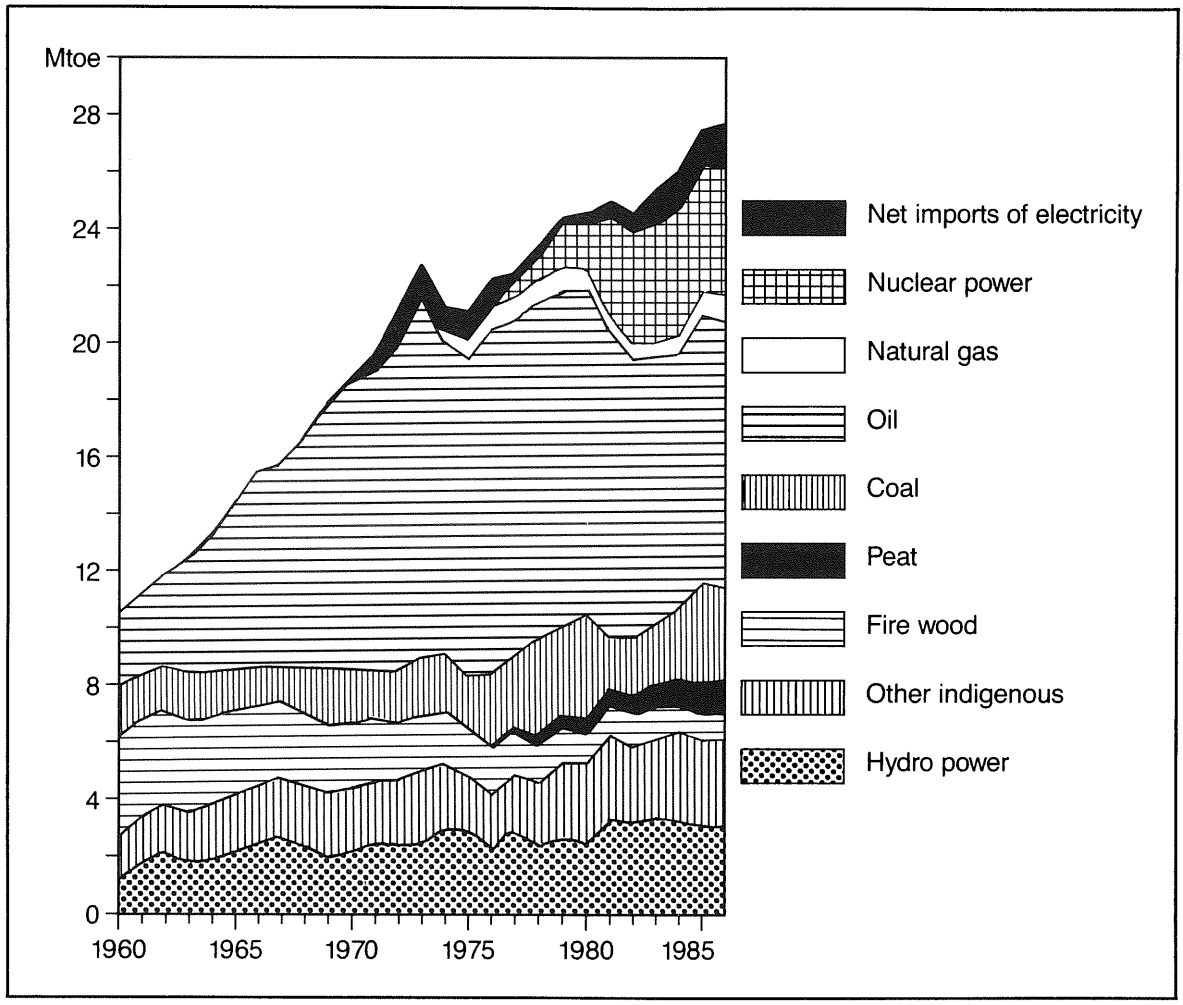

Figure 14. Primary energy consumption by source.

5.5 Finland as an energy consumer

Finland's share of world energy consumption is about 0.3%. Her share of consumption of the world's non-renewable sources of energy is approximately the same.

Converted into oil equivalent, Finland's total energy consumption was about 5.5 tonnes per capita in 1985, i.e. about 1.8 times the average for the European OECD members. Sweden's consumption per capita was higher, but countries like the Federal Republic of Germany, United Kingdom and France consumed substantially less energy per capita than Finland.

Finland's energy self-sufficiency rate was 32% in 1985. If, following the OECD's statistical practice, nuclear energy is considered a domestic source, the self- sufficiency level rises to 42%. This is below the European industrial countries' average of 62%.

When GDP is compared with the amount of energy consumed, it is revealed that Finland nowadays uses relatively more energy to achieve her standard of living than most other industrial countries. Our cold climate and the structure of our industry are the main reasons for this high energy consumption. In the main, energy consumption has been increasing slower than GDP since 1975. By contrast, growth in electricity consumption has been either in step with GDP growth or clearly faster than it. Over the long term, the same lines of development will be even more accentuatedly evident.

Table 15. Percentage costs of bought and used energy from the gross value of production in some industrial main groups (1986).

Manufacture group	Used energy %	Bought energy %
Manufacture of pulp and paper	14.4	12.2
Manufacture of chemicals	10.3	10.5
Oil refining	1.0	3.9
Manufacture of glass and non-metallic mineral products	11.0	11.0
Manufacture of iron and steel	16.5	16.9

5.6 Indigenous energy resources

Finland's potential energy resources are fairly large. Wood is used relatively little, but hydro power quite efficiently. The use of peat is increasing and, among other things, waste liquors produced by the pulp industry are efficiently used to produce energy.

Annual trunk growth in our forests totals about 68 million cubic metres per year. It has been estimated that this has an energy generation potential equivalent to more than ten million tonnes of oil. If one also takes into account the felling wastes, etc. that remain in the forests, the annual growth volume is nearly the equivalent of Finland's annual energy consumption in the 1980s. Wood accounts for 10% of the fuel used in industry and a quarter in agriculture and forestry.

The use of peat as fuel grew strongly in the 1970s, from 0.02 Mtoe in 1970 to 0.4 Mtoe in 1979 and then to 1 Mtoe in 1986. At the moment, peat accounts for over 4% of total energy consumption. Reserves are estimated at 12,000 million cu. metres of milled peat, which is the equivalent of 900 - 1,300 Mtoe.

The energy produced by hydro power fluctuated between 2.3 and 3.1 Mtoe in the 1970s and corresponded to about 10% of energy consumption in 1979. By 1986 it had risen somewhat, over 10%. However, in the 1960s it was still fluctuating between 13 and 20%. Hydro power accounts for about a quarter of the national electricity supply. It has assumed new importance in recent years, because it allows short-lived consumption peaks to be coped with more flexibly than other forms of generation. Efforts have been made to strengthen this characteristic of hydro power by means of various water construction and regulation schemes.

It is estimated that the rivers still suitable for harnessing in Finland could generate 5.6 TWh of electricity, or about 5% of energy consumption in terms of condensing power.

Wastes can also be considered an indigenous energy source. The forest products industry uses its own wastes as a considerable source of energy. Community wastes are also used in energy production, but to a very little extent only. The amounts of energy derived from wastes at the beginning of the 1980s were 1.6 Mtoe in industry and 0.3 Mtoe in the case of plants that incinerate community wastes.

Experiments involving the use of such materials as straw, reeds, domestic wastes and cattle and fur-farm wastes to produce energy have also been conducted in Finland. According to one study, biogas could be exploited on just under 3,000 cattle, pig and poultry farms. The most optimistic estimate indicates that the combined effect of biogas reactors on farms could total nearly 30 MW. The importance of this in energy management would be mainly local.

Research and trial operations have been conducted in relation to exploiting solar and wind energy. In southern Finland, for example, the total annual amount of solar radiation reaching the ground is 3 - 4 GJ/m^2. The productive period for solar panels with a constant-voltage load begins in February and continues until the end of October. However, the importance of solar energy in the overall pattern of energy management can not be expected to become important any time soon. Locally, particularly in coastal regions, wind energy may play a role. Heat pumps have enabled the solar energy stored in the soil and water to be used for such applications as space heating in dwellings.

5.7 Economical and efficient use of energy

The foci of energy-saving measures have been on production and use in general. The main emphasis has been on improving the energy economy of buildings and industry, because the greatest quantitative savings can be achieved in those spheres.

Energy-saving measures are aimed at the following sub-goals:

- Ensuring that the economy results achieved to date are permanent by, among other things, improving motivation to save energy. This is especially important in periods when energy prices are declining in real terms.

- Striving to exploit energy-saving potential created at times when prices were rising, but still unavailed of, by means of investments, research, information, counselling and training. Also by changing consumption habits as well as with the aid of maintenance and comparable measures, efforts are being made to ensure that results achieved to date are permanent.

The comprehensive goal set in relation to the economical and efficient use of energy is the achievement, in each sector of consumption, of characteristic consumption patterns corresponding to the available technology and the development of energy prices.

The knowledge and skills that energy users need to embrace energy-saving methods will be increased by publicizing the results of research in this field more effectively as well as by providing counselling and training. Likewise, efforts will be made to achieve user-specific savings plans, e.g. for buildings and industrial establishments.

Energy-policy aspects will be incorporated in the development of goals for community planning and building as well as in standards and legislation connected with these. Transport planning and policy should also be developed in accordance with energy-savings principles.

5.8 Energy prices

Essentially important sub-factors in energy management which impinge on the national economy as a whole are changes in the pattern of energy use, changes in the price of imported energy and the linkage between energy imports and Finland's trade with the CMEA ("COMECON") area, especially the Soviet Union. The changes that have occurred in the pattern of energy use in recent years have been of considerable import from the viewpoint of the national economy. Likewise, growth in the real price of crude oil has a clearly retarding effect on economic growth. When the bilateral character of Finnish trade with the CMEA area is taken into account, changes in the price of crude oil affect economic growth less. When the price of imported energy rises, growth in exports to the East compensates for the loss of domestic purchasing power. On the other hand, the boost that lower energy prices give growth offsets a decline in exports to the East. However, bilateral trade does not entirely offset the effects of changes in the price of imported energy.

The development of the consumer prices of various types of energy is shown in table 16 and figure 15. The last ten years have seen quite major changes in the structure of energy use.

In all cases except coal, the taxes included in consumer prices varied between 2 and 10% during the period in question. Those included in the consumer price of coal were between 4 and 16%.

Table 16. Consumer price of various types of energy in 1976, 1985 and 1987.

Source of energy	Consumer price 1976	1985	1987
		FIM/MWh	
Coal (at coast)	20	49	29
Natural gas	29	93	50
Milled peat (at point of use)	18	48	45
Light fuel oil	45	169	101
Heavy fuel oil	31	121	59
District heat			
• large apartment block	52	162	110
• small apartment block	59	181	140
Electricity			
• household, one-family house	208	325	360
• direct electrical heating	143	257	279
• industry, medium-sized	161	251	275
• industry, large	91	179	158

Imatran Voima Oy's (the Imatra Power Company's) share of Finland's national energy supply was about 45% in 1986. As the largest electricity wholesaler (share about 75%) and owner of the national grid network the company generally determines the level and tariffs observed in wholesale sales.

The H/73 system of wholesale electricity prices was adopted on 1.1.1973. This system comprises four separate tariffs, each consisting of basic and supplementary components. Thus electricity is priced on the basis of a fixed charge in combination with both effect and energy charges. The energy charge varies according to the time of day and year.

The H/85 system of wholesale electricity prices was adopted on 1.10.1985 and will remain applicable until 1995. In structure it consists of two tariffs, X0 and X1, of which the latter is a combination of three sub-tariffs: the P1 basic tariff, the K1 mean tariff and the H1 peak tariff. The X0 tariff is simpler and is applied to small-scale purchases. In these tariffs, too, the electricity is priced on the basis of a fixed charge in combination with both effect and energy charges. The energy charges vary according to the time of day and year.

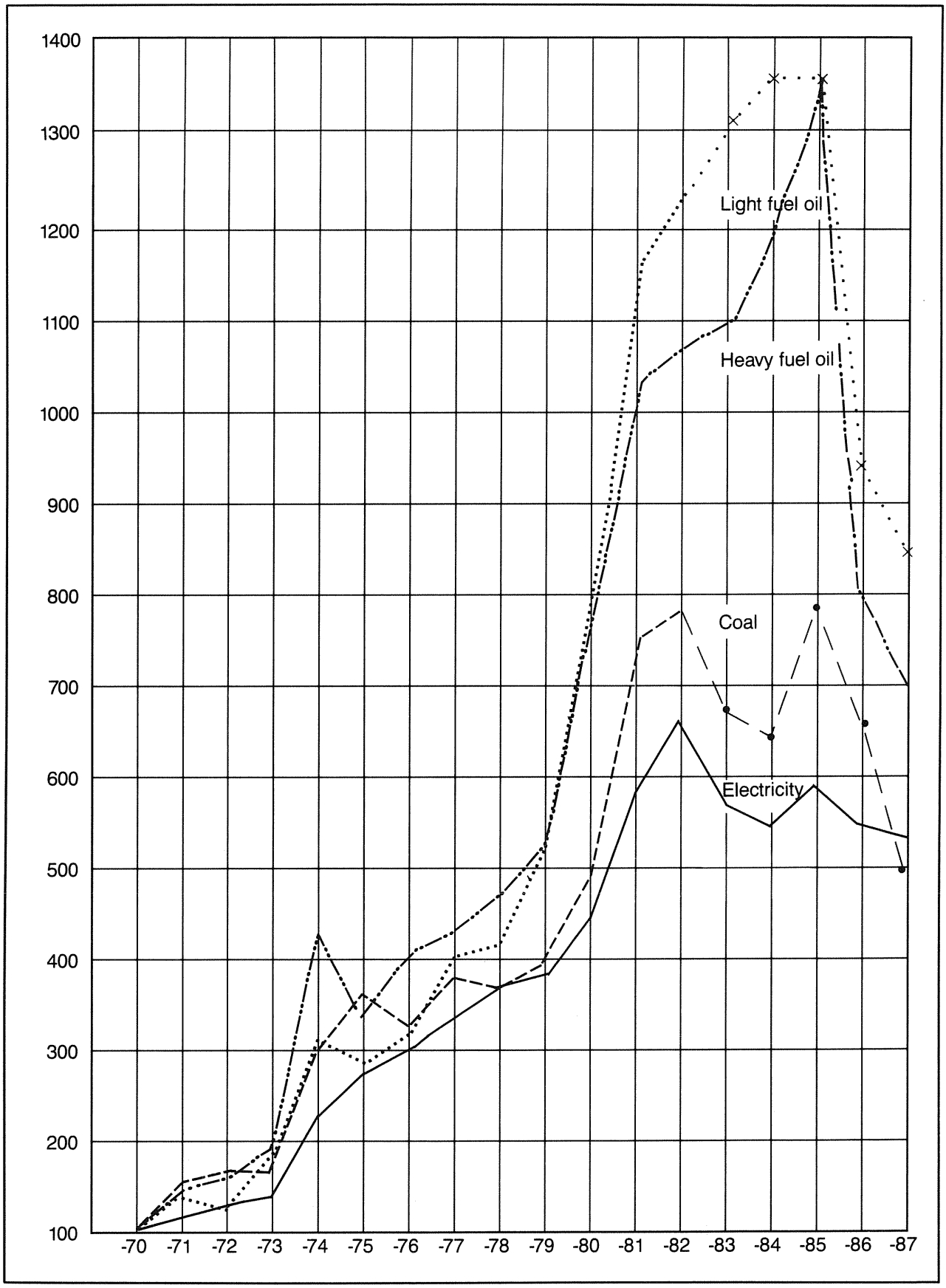

Figure 15. The development of the consumer prices of some sourc of energy and bought electricity in the industry, (Index: 1970 = 100).

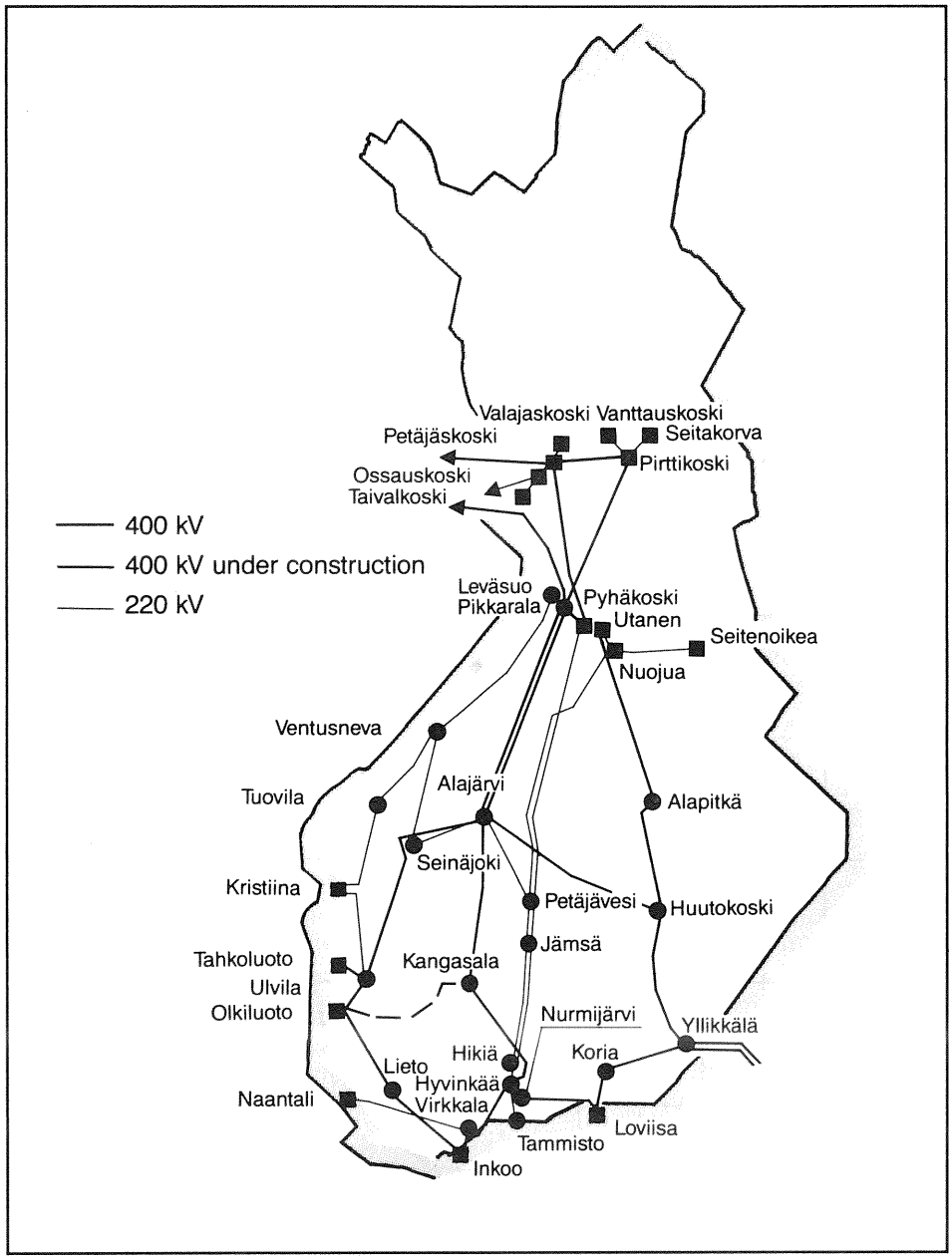

Figure 16. National 400 kV and 220 kV grid on 1.1.1982.

5.9 Implementation of energy policy

Significant results have been accomplished in the sphere of energy saving in Finland. The goals set have been achieved and in some cases exceeded. However, the degree of self-sufficiency has not risen to the extent hoped for.

In the 1980s so far, the use of energy in the economy has been over 20% more efficient than before the energy crisis in 1973. This means a saving that nowadays corresponds to nearly 7 million tonnes of oil a

year. The saving achieved in 1974-75 was around 10 - 15%. The percentage declined to below 10% in the latter half of the 1970s, but new increases in the price of energy in 1979-80 gave economy another boost, which appears to have been more permanent in its effect than the savings made after the first price crisis.

The fuel saving achieved by industry in the 1980s is 15 - 20% compared with the period before the energy price crisis; this applies both to the forest products industry and other sectors. By contrast, consumption of electricity has grown rapidly, especially in the forest products industry. A saving of clearly over 10% has also been achieved in the amount of energy consumed by transport. Very good results have been achieved in reducing consumption of energy for space heating, with an overall saving of about 40% in recent years.

There have been many reasons for the use of energy becoming more efficient. Price increases and action on the part of the authorities have led to savings measures and the introduction of more energy-efficient technology. Research and development spurred on by the 1973 price crisis have created good preconditions for more sparing use of energy. Industrial production and structural changes in the national economy have followed a trend conducive to more economical use of energy on the whole. Parallel to this, structural changes, changes in price relationships and technological development have boosted electricity's share of the total energy supply.

It does not appear that the use of indigenous energy will increase to the extent that was earlier expected. The competitiveness of indigenous sources of energy varies very considerably from one application to another as well as between different parts of the country. Each source is confined to a characteristic market niche in which its use can be promoted.

Peat harvesting is reaching a consolidated stage, in which operating costs have been brought under control. Imported fuels and, in certain cases, electricity prices as well impose clear limits on peat markets for large- and small-scale district heating plants and industrial use. With respect to wood, expectations have been focused on growing use of chips for fuel. At present prices, however, consumption of this fuel is stagnating.

As for other indigenous sources of energy, industrial wastes will probably be used to the full as fuel and no energy-policy instruments will be needed to promote this. Opportunities to harness additional hydro power are limited. Many new forms of energy are currently in the R & D stage and it may be a long time before they reach the market on a large scale.

In the years of the immediate future, the main points of the energy-policy programme will remain central. Thus solutions and measures intended to promote energy savings, cogeneration of electricity and heat, the use of indigenous energy inputs at least locally, and so on, will be developed. Consumption of natural gas will increase (see figure 17).

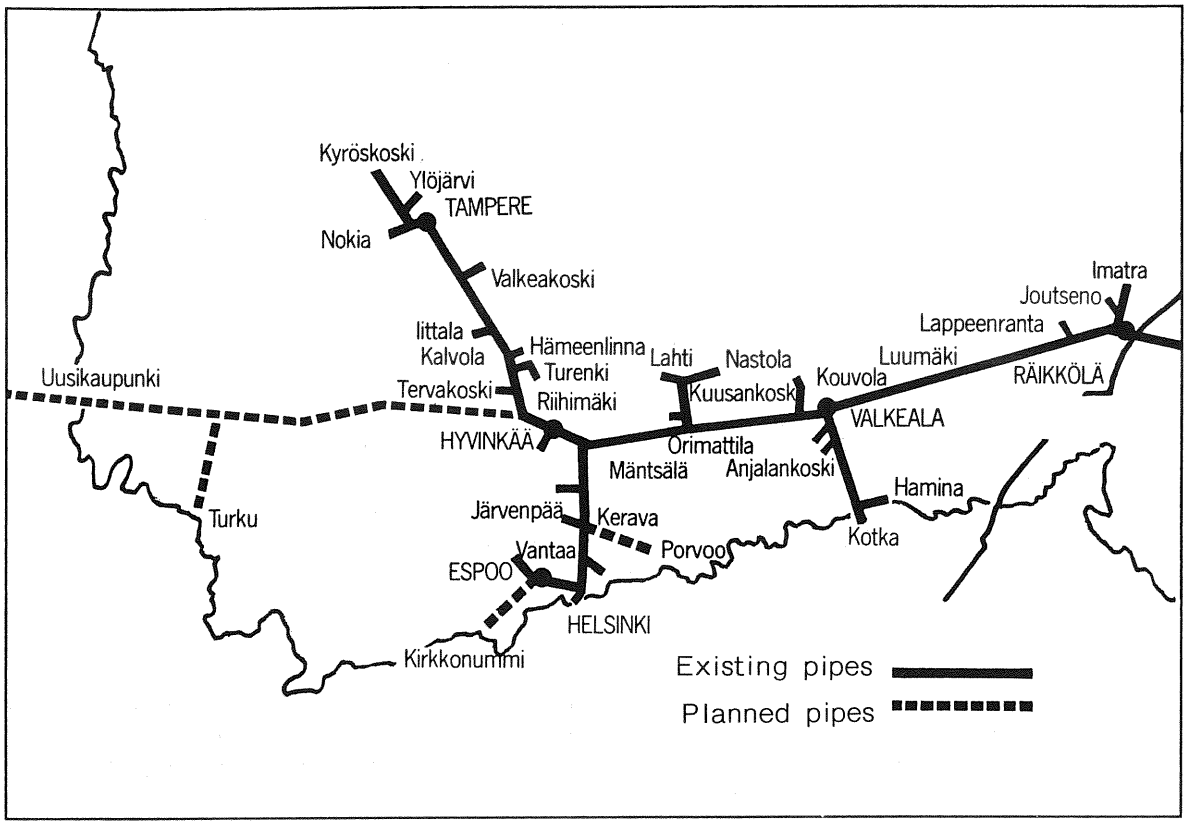

Figure 17. The existing and planned pipelines for the transporting of natural gas.

5.10 The environmental effects of energy production and research into them

In Finland in recent years, constantly growing attention has been focused on emissions into the atmosphere as a consequence of energy production, especially that involving the combustion of fossil fuels, as well as on the effects of those emissions. Safety questions attaching to the use of nuclear energy and the wastes produced have also attracted growing attention.

The goal of environmental protection measures in energy policy is to ensure that the state of the environment improves and health hazards are reduced. For its part, the purpose of environmental research in energy production has been to obtain the environmental data needed in the energy-policy decision-making process when they have not been available elsewhere or when experience and research results obtained elsewhere have not been directly applicable to Finnish conditions. The scope of this research has extended from studying the detrimental

environmental effects of producing and transporting fuels through investigation of impurities resulting from the use of fuels to their effects and the wastes generated in production. In recent years, a central role has been accorded investigations into the origin of emissions, their mode of creation, their behaviour, their impacts and the quantities involved. Study of the costs which they cause the national economy has also been included to some extent.

Oxides of sulphur and nitrogen as well as solid particles are among the substances emitted into the atmosphere when oil and coal are burned. Since 1980, sulphur dioxide emissions caused by the combustion of fossil fuels have declined by nearly 40%, from 360,000 to 225,000 tonnes. This reduction is mainly attributable to a change in the structure of energy production. Sulphur-free or low-sulphur fuels and production modes have replaced those involving higher sulphur contents. In addition to this, the average sulphur content of the oil products used in the country and consumption of heavy fuel oil have declined. Indeed, energy policy is an efficient means of reducing sulphur emissions.

Sulphur emission quantities and the way in which they are produced are relatively well known in Finland. In the southern regions of the country, most sulphur dioxide emissions originate in district-heating or condensing power stations. In other areas, industry contributes a more important share. The first exploration of sulphur emissions was conducted in 1973. A study of emissions from fossil-fuel-burning power stations with capacities of over 15 MW was conducted in the late 1970s. This fo-cused on oil-, coal- and peat-burning power stations and district-heating plants typical of Finland. Their flue gases were analyzed for dust, oxides of sulphur and nitrogen in addition to heavy metals, polyaromatic hydrocarbons, radioactive substances and mutagenity. Since then, studies of emissions from small (15 MW) boilers using liquid and solid fuels, including some in private properties and district-heating plants using indigenous fuels, have been continued. In the latter case, studies have gone into such details as emissions from central-heating furnaces. Measuring techniques and equipment have been developed in order to make the measurements recorded more representative and dependable irrespective of who carries them out.

Desulphurization techniques have been studied in conjunction with combustion by adding various substances to the fuel being burned, mostly lime in various forms. This has been combined with various combustion techniques, such as fluidized-bed combustion. The effects on desulphurization techniques of altering combustion conditions have also been studied, as have methods of removing sulphur from flue gases. Research in relation to reducing sulphur emissions continues to focus on removing the sulphur from the fuel itself, in conjunction with combustion and from flue gases. Particular attention will be devoted to various combinations of these and to the economic aspects of using them in different applications as well as to the utilization or disposal of wastes created in desulphurization processes.

A study of nitrogen emission volumes and causes is currently in progress. The methods by which fuels are burned and the conditions in which this is done play a decisive role in the creation of those emissions. It has been tentatively established that the highest emission levels are caused by motor vehicles and burning heavy fuel oil and coal. Increasing use of

heavy fuel oil and growing traffic boost emissions of nitrogen oxides. With a view to reducing emission levels, research is being concentrated on changes in combustion techniques and regulation of combustion processes. Subjects now being studied are how nitrogen oxides are created, emission sources, how to reduce emission levels with the aid of combustion technology, the applicability of secondary-combustion methods and means of reducing vehicle emissions.

Table 17. Energy-related sulphur dioxide emissions into the atmosphere (tons of SO_2).

	1980	1984	1986
Oil refineries	44 000	34 000	31 000
Heavy fuel oil	213 000	104 000	95 000
Light fuel oil	40 000	15 000	9 000
Diesel oil	9 000	5 000	4 000
Motor gasoline	1 000	1 000	1 000
Coal	88 000	67 000	72 000
Black and sulphite liquors	83 000	41 000	35 000
Peat	6 000	7 000	7 000
Total	484 000	274 000	254 000

Leaving transport out of the calculation, it has been estimated that slightly under 100,000 tonnes (NO_2 equivalent) of nitrogen oxides were created in conjunction with energy production in 1984-1986. Transport accounted for about 100,000 tonnes.

Particulate emissions in flue gases have also been studied using a variety of methods. Economical filtration methods suitable for peat-fired power stations have been given special attention here, because the ability of existing equipment for trapping filters has been developed almost to the limit. Features that will have to be kept in mind in searching for more efficient filters are dependability of operation and economical aspects. Structural development aimed at making filters more suitable for various applications will be conducted.

Particulate emissions are forecast to increase slightly as more fossil fuels are used. In smaller plants (<1 MW), fluctuations in the properties of fuels and low automation levels will increase dust emissions.

Energy production is forecast to cause an annual total of 50,000 - 70,000 tonnes of particulate emissions in the 1980s.

Natural gas is quite a clean fuel. The main impurities emitted when it is burned are carbon dioxide and nitrogen oxides.

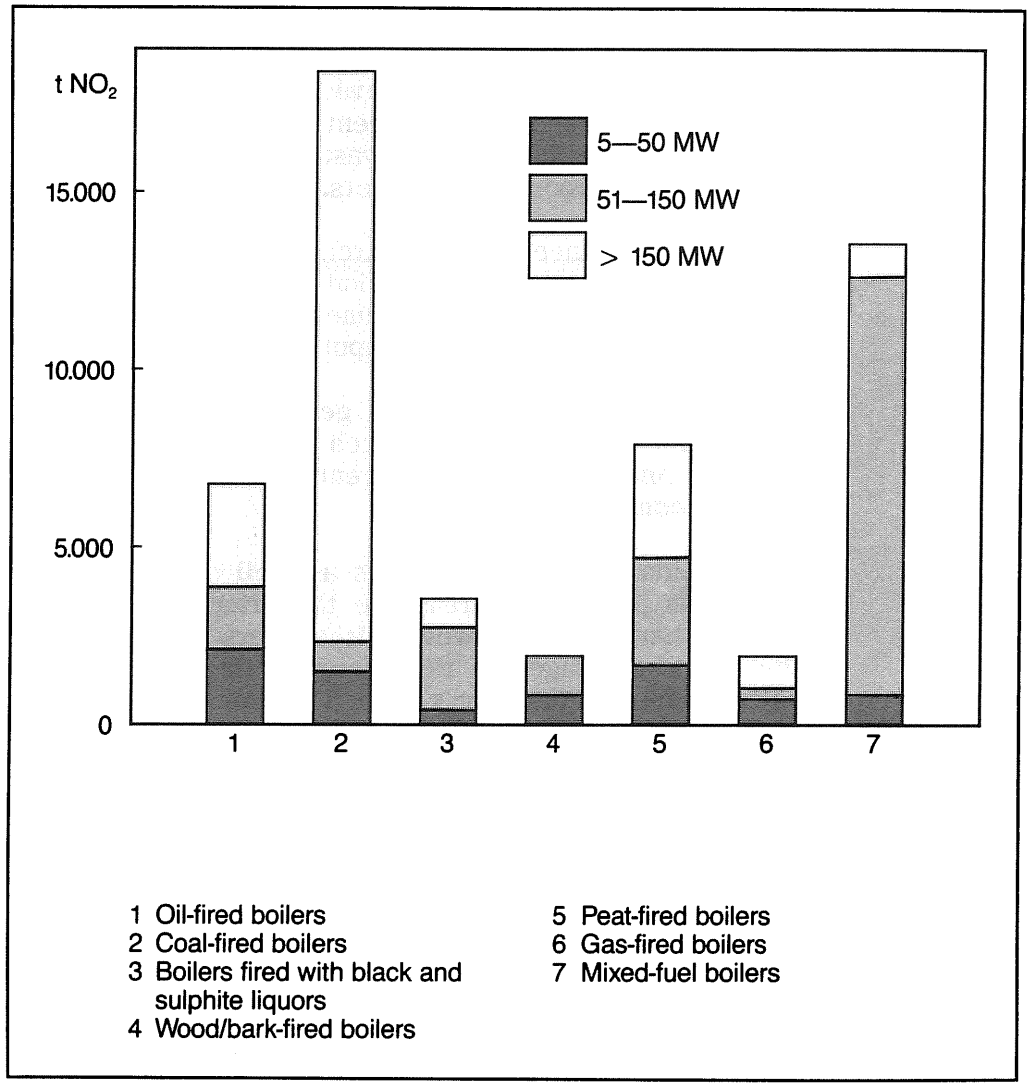

Figure 18. Energy-related nitrogen oxide emissions into the atmosphere.

Nuclear power stations emit low levels of radiation into the environment in the course of their normal operation. At most, these increase the radiation dosage which humans receive from natural background radioactivity by a few percent. Thus the additional radiation dosage received from those reactors can be drowned out by chronological and local fluctuations in natural dosage levels. Indeed, the point of departure for the normal operation of nuclear power stations is the principle that the dosages they cause must not increase the exposure of workers and nearby residents to radiation by any substantial margin. Other detrimental effects on the environment stem mainly from the heat in cooling water. This problem is in Finland slight and local. The environmental effects of using nuclear energy have been studied and monitored by the safety authorities as part of their supervisory duties since its use began in Finland. This has involved regularly metering different kinds of samples

taken from the vicinities of nuclear power stations to determine their contents of various radioactive substances. The samples mainly represent the chains through which the substances in question are carried to people. There has been no evidence of any substantial change in the dosage level to which people living close to nuclear power stations are subjected. Separate studies have also been carried out to evaluate the environmental impact of accident situations as well as in relation to methods of handling nuclear wastes and final disposal solutions together with their environmental impacts.

Subjects that have been researched in relation to the effects of impurities caused by energy production include soil acidification and its effects on the natural environment and forest yields. Studies to determine the effects of emissions of impurities will be stepped up.

The quantities of solid wastes generated in producing energy will increase. In addition to research concerning nuclear wastes, means of utilizing and disposing of conventional energy production wastes will also be conducted.

Destruction of natural habitats as well as leaching of humus and nutrients from production areas are the principal environmental drawbacks of peat harvesting. However, it appears that peat production and use at the levels envisaged in the energy policy programme can be implemented without greatly harming peatland conservation. The most conspicuous environmental effects of procuring indigenous fuels are those caused by solid matter and leached nutrients flowing into water bodies. The character of this loading has been explored. The concentration since then has been on methods of reducing loads as well as on developing inventory methods for peat resources.

The environmental effects of harnessing hydro power are the loss of natural landscapes and deterioration of water quality in addition to reduction of fish stocks. Large reservoir schemes also cause negative social and economic effects. The current focus of research is on the damage that icejams cause to hydro power management as a result of short-term regulation by hydroelectric power stations during the winter, flood damage, erosion and other harmful effects on the environment. Problems of this nature manifest themselves on both unharnessed and partly harnessed parts of water courses.

Impurities stemming from vehicular traffic are dust, lead, carbon monoxide, polyaromatic hydrocarbons and nitrogen oxides. Their effects can be reduced by means of transport policy, technological development of vehicles and by reducing lead and benzene contents in fuels.

5.11 Development of environmental research in relation to energy production

Energy research is one means of implementing energy policy goals. Thus the central sectors in energy research are the same as those emphasized in energy policy goals. This research is intended to promote, among other things, savings in the national energy economy, indigenous energy supplies, security of supplies and environmental research concerning the effects of energy management.

By 1986, the Ministry of Trade and Industry, using funds appropriated for energy research, had financed, either alone or together with other financiers, some 40 completed projects and about as many commenced ones, all intended to study and mitigate the environmental impacts of energy production. So far, over 11 million finnmarks has been spent on those projects. That figure does not yet include research into the environmental effects of using nuclear power nor of nuclear wastes. This is mainly conducted in conjunction with other research into nuclear energy and as an intrinsic part of the authorities' safety inspection duties. Separate studies in this sphere have mainly concentrated on the management of nuclear wastes. All in all, more than 20 million finnmarks has been spent on studying the environmental effects of nuclear energy, nearly twice as much as on other energy-related research.

Environmental research and experiments relating to energy management are currently being stepped up by, among other things, financing R & D projects aimed at reducing emissions. This research covers all non-nuclear fuels and the entire combustion chain, i.e. fuel production and purification, combustion itself and dealing with the emissions and wastes created. The idea is to develop technology for reducing emissions from combustion facilities. A separate research project dealing with emission of nitrogen oxides, how they are created and means of reducing them is also in progress.

The research totality that has been deemed suitable from Finland's point of view includes metering emissions, analysis and monitoring methods, other combustion and purification technology, especially in relation to indigenous fuels, as well as research into emissions caused by transport, the pulp industry and peat production. In those sectors in which research backed by large resources is being conducted elsewhere in the world, we are concentrating on following-up the know-how obtained and adapting it to our conditions.

The Ministry of Trade and Industry has studied development needs in relation to research into the environmental effects of energy production and estimates that expenditure of 5 - 7 million finnmarks a year will allow the most important studies concerning technology for reducing emissions and its development to be conducted for the next 3 - 5 years. The construction of trial facilities will require considerable financing in addition to this. It has been estimated that the financing needed for studying the environmental impacts of using nuclear energy and managing nuclear wastes will be just under 10 million finnmarks per year.

III ENVIRONMENTAL POLICY, LEGISLATION AND ADMINISTRATION

6 ENVIRONMENTAL POLICY AND STRATEGY

6.1 Government environmental policy

General environmental protection goals have been given comparatively little consideration in Finland, especially from a long-term perspective. Likewise, alignment of environmental protection with other sectors of social policy is still in its infancy. Prospects were, however, improved when the Ministry of the Environment was set up in 1983, enabling environmental affairs to be handled and environmental protection to be advocated and defended at the highest political level.

In September 1984, the Ministry of the Environment gave Parliament a report, which included the following passages:

Environmental policy - a new sector of societal policy; its tasks

The purpose of environmental policy is to protect, improve and develop the environment. It comprises environmental protection, physical planning, building control, and to a large extent, housing policy as well. In other words, it is a matter of arranging relations between man, the rest of nature and the man-made environment. The achievement of environmental protection goals presupposes balanced development of society. It is particularly necessary to study the needs and plans on which this development is based, and also the ways in which physical planning and building are developed.

Environmental protection goals must be taken into account in other sectors of social policy, especially economic and trade policy. Environmental protection must be given a more identifiable role in the use of natural resources. The necessity of Environmental protection must be understood as essential in industry, energy management, urban and regional planning and building, including civil engineering, as well as in agriculture, forestry, transport and other sectors of the economy which exploit natural resources and have an impact on the environment.

The future of the environment

Environmental changes and the state of the environment in Finland

The environment has been altered by industrial development and population concentration. There has been a continuous acceleration in the utilization of natural resources, and discharges into the water and air have increased. A great number of our watercourses are harnessed or otherwise regulated. Finnish forests are turning into tree plantations; some species of animals and plants have become extinct and many others are endangered.

Many people work and spend their leisure without contact with the natural environment. But in spite of all the changes that have occurred and the pollution load that exists, the state of our environment remains at least satisfactory and in many respects good. A successful environmental policy can be pursued through balanced development of society, by over-hauling the environmental administration and research in this field and through education and training.

International perspective gloomy

From the global point of view, the future of the environment looks gloomy. Natural resources are being depleted and even the climate is changing. One of the most difficult tasks facing humanity is that of exploring and dealing with the closely linked problems of population, natural resources, the environment and development. It is Finland's duty to use the means she has at her disposal. She must regard international and global environmental problems as her own, because solving them is part of a strategy to ensure the survival of humanity.

Adjustment to environmental limits

The global outlook for the environment strongly affects Finland, which utilizes her own natural resources intensively and is highly dependent on foreign trade. The average Finn consumes at least ten times the volume of raw materials that the inhabitants of the earth do on average. A priori, Finland must prepare for and adjust herself to environmental limits.
Her means of livelihood must be based primarily on sustainable use of renewable natural resources. More than ever before, energy management must be based on diversified, flexible use of sources which harm the environment as little as possible. The principles of non-waste and low-waste technology, which Finland already follows in many cases, must dominate all sectors of technology.

Setting targets for environmental protection

There are plans to implement programmes for various sectors of environmental protection. Those already completed or being prepared cover water management, nature conservation, environmental research, clean technology, re-use and recycling of waste and reduction of sulphur emissions. The targets for the various sectors of environmental protection and their co-ordination will be determined by the Government or, if necessary, by Parliament.

The focus of environmental policy

Environment protection, along with defending peace and promoting disarmament, is one of the most urgent matters of our time. If we cannot meet these challenges there is the danger that more and more people, especially the young, may lose faith in our society, something that would strike at the very roots of our democracy. It is essential to proceed gradually

> in a sphere such as environmental protection. There must be a determined effort to protect irreplaceable environmental values. Finland must pursue an environmental policy which has clear targets and is based on both harmony between man and nature and democratic principles. It must recognize and take into account the international dimensions of environmental policy, which must be co-ordinated with the rest of social policy.

So far, the conversion of the general goals outlined above into concrete objectives for various sectors has not been done in a determined nor consistent manner. The Ministry of the Environment's means of influencing annual state budgets (the four- or five-year operational and financial plans drafted for various administrative sectors and the goals of planning in those sectors) have been very modest. By contrast, there has been success in developing bilateral links with other sectors of administration.

The Ministry of the Environment has rather close contact with the Ministry of Agriculture and Forestry, the Ministry of Communications, the Development Co-operation Department (FINNIDA) at the Ministry for Foreign Affairs, the National Board of Forestry and the National Board of Navigation. Representatives of the Ministry of the Environment sit on advisory and decision- making bodies in other sectors of administration, dealing with water management, forest management, energy policy and supply, tourism, radiation safety, nuclear energy, environmental research and chemicals-related matters. These are still many sectors with which the Ministry should improve its co-operation for instance, the public health, food-inspection, labour protection and labour authorities, the civil aviation authorities, as well as those responsible for fisheries, education and physical training.

Some administrative sectors, such as the Ministry of Defence and the Defence Forces, the Road and Waterways Administration and the National Board of Navigation, have on their own initiative set up units to handle environmental protection measures. Permanent advisory committees and working groups operating under the Ministry of the Environment and dealing with waste management, air pollution control, protection of the marine environment, noise abatement and nature conservation include representatives from numbers of other administrative spheres and also from outside the administrative sector, e.g., from central local-government organizations, industry, the trade unions and environmental protection organizations. So far, no such advisory bodies have been set up to deal with outdoor recreation or environmental research.

The role of an environmental ministry or agency is no different from that of any other ministry or agency. Public authorities responsible for environmental protection do not replace non-governmental organizations. Neither can they reduce the importance of public participation or the probability of civil disobedience in environmental matters.

The environmental protection authorities must have sufficient intellectual and administrative resources to ensure that no action is taken is without adequate assessment of its environmental impact.

One of the main instruments in shaping social policy is planning. Environmental impact should be assessed not only through individual projects but also in sectoral planning. Of particular importance are

medium- and long-term plans. The public sector is responsible for only a limited part of the economy in market-economy countries. Therefore it is important that also the private sector should recognize its responsibility for ecologically sound and sustainable development.

An essential precondition for the development of more effective integration is assessment of the influence of environmental considerations on policies primarily relating to other sectors. Once this has been achieved, opportunities for effective integration could be examined sector-by-sector, together with ways to eliminate prejudices and other obstacles to integration.

Integration of different sectoral policies is still unplanned, incoherent and inadequate and needs to be made more efficient and successful.

Some of the problems hindering alignment of environmental policies are:

- the multiple-use principle in forestry;
- mining;
- use of fertilizers in agriculture and forestry;
- titanium dioxide production;
- planning and construction of transport infrastructure;
- land-use policy;
- environmental health programmes;
- water management, especially the use of hydropower;
- the forest industry vs. nature conservation and reindeer herding in northern Finland;
- fuel prices;
- car taxes;
- indigenous fuels.

The multiple-use of forests was not fully applied as a special principle until recent years. The economic situation after the Second World War was such that the emphasis was on wood production alone. The subject is dealt with in greater detail in Chapters 4 (forest management), 12 (recreational use of the natural environment) and 13 (nature conservation).

As to mining, it is obvious that legislation favours both exploration and mining operations at the expense of all other functions. Processing of pyrite ores was in danger of causing severe pollution of the environment, but techniques developed by the Finnish metallurgical industry have enabled the most difficult problems to be solved.

The only manufacturer of fertilizers in Finland is a large state-owned company. Farmers and forest-owners are encouraged to use fertilizers by the tax structure. The FOREST 2000 programme envisages increased use of forest fertilizers, something that has not been looked at from an environmental angle, although it may have effects on both water bodies and - at least hypothetically - the atmosphere.

The same company that manufactures (and exports) fertilizers also operates the country's only titanium dioxide factory, Vuorikemia. This facility, which is located in Pori on the west coast, probably has the most advanced anti-pollution equipment and methods of any sulphuric acid-based titanium dioxide process anywhere, but the impact of its emissions on the recipient, the Gulf of Bothnia, is still great.

The environmental impact of the planning and building transport infrastructure has not yet been systematically assessed. From the viewpoint of environmental policy, the necessity of projects to develop this infrastructure, especially motor ways, should be studied. This is not generally done; instead, the parties included are content to study deleterious environmental effects and means of minimizing them - after decisions to begin construction have been taken.

In practice, land-use planning often serves functions which have adversely altered the environment. Despite the often admirable goals incorporated in the Planning and Building Act, planning practices do as much to harm as to enhance the environment. Regulations about land-owners' right to use their property in such a way that it clearly harms general environmental interests are very loose in Finland.

There has been quite little research in the field of environmental medicine in Finland. Co-operation between the environmental-protection and public health authorities is at present unsatisfactory.

Regulation and construction of water bodies, especially for power generation, has caused extensive changes in river ecosystems. The way in which legislation assesses interests and juridical practices have not taken adequate account of the need to protect the aqueous environment and livelihoods based on natural use of the environment (such as fishing, berry picking and reindeer herding) nor the broadly-based opposition that has been mounted in the face of change.

The forest products industry in northern Finland is so large that there are persistent doubts about the feasibility to making a compromise between its needs and the interests of environmental conservation and means of livelihood such as reindeer herding.

So far, air pollution control has been considered only to a modest extent in fixing motor fuel prices. The present allocation of the car tax is questionable in terms of both traffic safety and environmental protection.

The environmental effects of exploiting indigenous fuel sources has not been properly considered in efforts to promote their use.

6.2 Participation by the public and civic organizations in environmental protection

6.2.1 Civic organizations

The earliest civic organizations involved with environmental protection emerged in Finland in the latter half of the 19th century. Then, and for a long time thereafter, most of the work of this kind was done by scientific societies. The first civic organization to represent the public at large was the **Finnish Nature Conservation Association,** which was founded in 1938. It was active in making proposals and in instructing and training the public. However, most of its work was focused on scientific aspects and took place mainly in and around Helsinki. The most important developments in the early years of its existence were the creation of nature reserves, protection of rare species of flora and prevention of destructive exploitation of nature.

The ideological scope of the Association's work began to expand in the 1960s. It changed its name to the Finnish Environmental Protection Association and set up a network of regional and local branches. There are now 16 regional and about 170 local branches, in addition to two fund-raising support organizations. A sister organization called **Natur och Miljö** ("Nature and the Environment") works among the country's Swedish-speaking citizens. Both organizations have national youth bodies. All in all, the two networks have nearly 40,000 members. The World Wildlife Fund (WWF) has a national organization in Finland, founded in 1972.

In several recent interview-based opinion polls, citizens have expressed their skepticism about the ability of official organizations to respond to present-day challenges. Both political parties and public authorities have come in for their share of criticism. Characteristic of young people's mood has been a sense of alienation and the belief that their own means of influence are inadequate.

In the 1960s, a general feature of the stand taken by those actively concerned was a neo-leftist tendency to criticize society as a whole and, on this basis, to present alternative societal models. This thinking was also clearly internationalist in tone and included consideration of relations between the industrial and the developing countries. Pollution and waste of natural resources were attributed to the sa,e causes as were social injustices and global economic and political problems.

In the 1970s, left-wing thinking was largely replaced by the emergence of alternative movements more dissatisfied with existing society and its organizations and which, despite the small number of active supporters, are very vocal in public debate. Many of these are single-issue movements. The best-known of them in Finland was one that resisted a project to drain of Lake Koijärvi, a privately-owned wetland and one of the most important waterfowl habitats in the country. Acts of civil disobedience by several of its members led to their being prosecuted on criminal charges.

With the increasing dominance of alternative movements over public debate, criticism came to focus, virtually without distinction of nuance, on economic growth as such, almost totally blotting out such issues as the conflict between labour and capital. The debate has also turned in on itself and has at times been associated with mystification of nature. In

the way others see the alternative movements, the crucial factor is the stance taken on the peaceful use of nuclear energy, which the movements oppose on grounds familiar to all Western industrial countries.

The alternative movements discussion of lifestyles, criticism of the consumer society and expressions of international solidarity tend to be disjointed, fragmented and tendentious. One of the main issues occupying their rallying force in Finland, the Greens, concerns whether the movements should constitute a political party and draft a comprehensive programme. Opinions are sharply divided. However, it has been possible to condense the thinking of the movements into the following four demands:

- the self-regenerating capacity of nature must not be exceeded;
- people's endurance must not be exceeded;
- the long-term impact of decisions must be taken into consideration;
- not a single bill must be left for future generations to pay.

There are no estimates of how many people are involved in civic action in one way or another, but interview-based public opinion polls indicate that more than half the population are willing to support civic action on behalf of environmental protection and about a quarter are willing to participate themselves. Only 5% oppose such action. More and more people also specify environmental protection as their primary social goal. Other opinion polls indicate that environmental protection comes second only to employment as one of people's main concerns, and thus has recently overtaken such concerns as housing, social questions and education.

6.2.2 Political parties

The first environmental-policy programmes to be drafted by political parties date from the late 1960s and early 1970s. By the end of the 1970s, nearly all the parties had published a programme or position paper on this issue.

These naturally reflect the parties' general views on society and the world. Thus to the political left consider intervention in the structures and functions of the economic and production systems an essential precondition for the effective implementation of environmental protection. Non-socialist parties, by contrast, do not criticize the prevailing social system, but attribute environmental problems mainly to irrational and short-sighted behaviour, which could be adequately remedied by changing attitudes, without having to touch production or economic structures. Parties belonging to the political centre believe that environmental problems stem specifically from changes in economic structures and industrial production modes with all their related structural and cultural changes. On the left, the entitlement of society to encroach, if necessary, on private proprietary rights and freedoms is considered a precondition for the implementation of environmental protection; in the centre and on the right, by contrast, this entitlement is viewed with reservations.

If their basic ideological biases are disregarded, these programmes have been and still rather similar to each other, in many respects. Pretty well all of them condemn in more or less the same way such things as squandering natural resources, pollution of the soil, water and air, production based on short-term economic benefit, shortcomings in legislation and its backwardness in relation to present-day requirements. Principles which all consider worthy of support include recycling of materials, the development of technology and production methods and legal action - including demands for financial penalties - as a last resort against polluters. On the last question, however, the right wing considers a financial support system, set up out of public funds, neces-sary if flexible and rapid investment in environmental protection is to be possible in the industrial sector.

In the second half of the 1980s environmental considerations have received increasing weight and attention in the programmes and statements issued by political parties. A major achievement from environmental standpoint is that the Social Democratic Party, which is the biggest party in the Parliament, drew in 1987 an Environment Policy Programme which, in many ways, aims at reconsidering the objectives of development. One of the goals of the Programme is to "relieve humans from the obsession of increasing goods production and consuming". Environment policy is to be given a special status in relation to other sectoral policies and all economic activity is to be guided by environmental policy. The principle of integrating environmental policy into other policies has in general, received more attention among the political parties.

6.2.3 Labour-market organizations

The trade-union movement began to take a stand on environmental protection questions in the 1970s. The principal matter dealt with in the subsequent discussion has been the extent to which the movement is entitled to intervene in general politics, i.e. in matters other than wages and labour-market policies.

Finland's largest trade union confederation SAK (The Central Organization of Finnish Trade Unions), which mainly represents industrial workers, commissioned a questionnaire-based study in 1985. According to this, five of its 28 affiliated industrial unions had adopted special goals in relation to environmental protection. However, another study commissioned by the Paper Workers' Union, one of SAK's biggest and most influential members, indicated that the union's membership considered the prevention of environmental pollution its second most important task. The Paper Workers' Union has also published a position paper on environmental protection, in which special emphasis is placed on the responsibility of workers and their duty and right to participate in environmental protection activities at their place of employment.

In 1981 SAK's congress adopted the following goals in relation to environmental protection:

- promotion of production and technology that reduces environmental loads;

- stepped-up action to improve the state of the environment;
- safeguarding employment by developing production methods conducive to environmental protection and by devoting resources to this purpose at work places;increasing workers' authority and influence in order to reduce deleterious impacts on the environment;
- strengthening democracy in relation to the use of natural resources and preventing the despoliation of nature under the pretext of ownership rights.

Another confederation, STTK (The Confederation of Technical Employee Organizations in Finland), which represents supervisory staff and persons with technical training, is also becoming more active in the sphere of environmental issues. At its congress in autumn 1985, STTK declared the adoption of an environmental protection programme to be one of its central goals.

AKAVA (The Central Organization of Professional Associations in Finland), which represents university-trained employees, included a statement on environmental management in its social policy programme adopted in 1982. This states that:

- adequate attention must be paid to the development and protection of the living habitat in all social activity. In environmental protection work, particular emphasis must be laid on molding attitudes;
- in her international contacts, Finland must support endeavours to ensure that living conditions adequate to meet the needs of society are preserved on our planet.

On the employers' side, environmental protection questions are not considered to be within the compass of labour-market affairs. Thus STK (The Finnish Employers' Confederation) has taken no official stance on environmental protection, pointing out that The Confederation of Finnish Industries (see 6.3) represents employers in questions of environmental protection.

MTK (The Central Union of Agricultural Producers) took a stand on environmental questions in its programme of principles and goals in 1982. The organization's position on environmental protection can be summed up as follows:

> Agriculture is founded on the utilization of renewable natural resources, adapted to the biological laws and rhythms of the natural economy. The production methods used in agriculture and forestry should take into consideration principles of sustained use of natural resources. These principles are best implemented on family holdings. Artificial fertilizers and crop chemicals are aspects of the modern production technology required to produce high-quality foodstuffs.

Vital and developing agriculture is the foundation of a pleasant countryside. Conservation programmes should not be over-dimensioned, thus weakening rural development and detracting from the viability of private holdings.

Environmental legislation should be developed in such a way that pollution of the soil, air and water is prevented. The administration of environmental affairs should be made more efficient by making environmental management and consideration of natural resources an integral part of planning and decision making in every branch of the administrative system.

6.3 Industry and environmental protection

The industrial sector has naturally participated in the debate on environmental protection. In 1984, the Confederation of Finnish Industries published a paper entitled "Industry and Environmental Protection", which can be considered a definition of industry's current stance on environmental questions. The Association of the Finnish Forest Industry, which represents the most important industrial sector in Finland, has also published an environmental protection programme.

The paper published by the Confederation of Finnish Industries focuses attention on water pollution control, air pollution control, waste management and, to some extent, on noise abatement, i.e. on environmental pollution and means of combating it.

Industry takes the view that good progress has been made environmental protection in Finland during the last ten to fifteen years Finland and that the state of the environment is continuing to improve. This favourable development has been aided by anti-pollution measures and industrial structural changes conducive to environmental protection. Since growth in basic industries, which cause the heaviest burden on the environment, has virtually ceased, the problems cannot be expected to worsen.

Industry stresses that environmental protection must be implemented within the limits of practical possibilities and economic feasibility. This is seen as a direct precondition for the implementation of environmental protection, because a profitable and competitive company can fulfil its environmental protection obligations substantially better than a struggling one. According to the paper, part of Finnish industry has already reached the point at which more justification is needed than before for tightening up environmental protection requirements, and another part is approaching that stage; this applies at least to protection of the water and air. Industry sees that the implementation of an effective environment protection policy can only be based on careful cost-effectiveness study in every single case. The cost-effectiveness analysis is nothing new in Finland because the Water Act obliges comparisons to be made between the various interests when dealing with effluent discharge matters.

Concerning air pollution abatement industry gives priority to programmes which deal with the most significant air pollution problems in a cost-efficient way. When health-related air pollution problems have been solved priority is given to acidification. In relation to acidification

problems the industry calls for international responsibility and co-operation abroad.

As a contribution to the acidification abatement the Finnish industries have actively co-operated with the Ministry of the Environment to prepare a cost-efficient reduction plan for the Finnish sulphur emissions. Based on that plan and the Air Pollution Control Act the Government has issued in 1987 a set of fuel standards and emission standards as well as guidelines for industrial and power plants with the aim of reducing the national sulphur emissions by more than 50 per cent between 1980 and 1993.

In the field of waste management, the most important task is to prevent damage to groundwater reserves and to stop hazardous wastes from escaping into the environment. The aim of optimizing recycling or other beneficial use of wastes is accorded secondary importance, if they are lost from the production processes. It should be left to the producer of the waste to choose the most cost-effective and suitable way to act if the above mentioned environmental criteria are to be fulfilled.

The paper also draws attention to questions connected with the management and dissemination of information. At the moment, there is a lack of fast, reliable and effective means of putting the new data being produced into a clear format and assessing their significance. Industry also feels that information dissemination contains deficiencies insofar as negative reports about the environment get into the news more easily than positive ones. This situation should be brought into balance through positive reporting. When new industrial projects are being planned, the authorities and the public should be informed in good time. Groundless criticism can also be reduced by showing initiative in providing information after disturbances have occurred.

Industry also takes the view that from the ecological point of view the most effective and most justifiable means to minimize industrial pollution is to develop production processes according to the principle of low-waste technology. It is, however, impossible to close production processes down entirely. In practical pollution control major modifications of the production process, e.g. process or plant renewals are therefore needed.

The discussion paper also ponders the procedures industry could adopt in environmental questions. The following are among the most important:

- increasing knowledge of administrative procedures;
- making a clear division of responsibility and preparedness for unforeseen situations;
- training supervisory staff and familiarizing workers with practical measures to prevent excessive environmental loads;
- including environmental protection equipment in preventive maintenance programmes, spare parts reservations and regular basic overhaul time-tables;

- developing cost monitoring and including environmental protection costs in companies' cost calculations;
- creating long-term environmental policies for companies so that potential environmental protection requirements can be foreseen.

6.4 Low and non-waste technology

The definition of low and non-waste technology is the result of international cooperation between the member countries of the ECE, in which Finland has been involved from the start. The definition was approved in Paris in 1976. Since then amendments have been made, and the definition was revised at the Tashkent Seminar in 1984. Briefly, low and non-waste technology may be described as the implementation of preventive environmental protection in the most rational manner possible, i.e. attempts to reduce waste and emissions making simultaneous allowance for environmental protection, and the saving of raw materials and energy (the rational use of natural resources). Low and non-waste technology applies to the entire production-consumption-return cycle. The principles and goals for the development of low and non-waste technology have been adopted in Finland according to the recommendations of the members of the ECE and were ratified in a memorandum of the ad hoc Committee of Low and Non-Waste Technology issued in 1980.

6.4.1 The application of low and non-waste technology in industry

In Finland - as in other industrial countries -the process industry in particular has long aimed at more effective use of raw materials and energy. This trend has naturally been influenced primarily by industry's need to reduce its raw material and energy costs. This has been furthered by the relatively recent (1960s and 1970s) investment of the chemical and other industries, in modern process technology. The energy crisis in the 1970s provided a major incentive for savings. The tightening up of pollution control supervision, the development of environmental protection legislation (stricter obligations under the Water Act, preparation of a Waste Management Act and an Air Pollution Control Act) and growing public opinion in favour of environmental protection at around the same time can also be considered to have helped direct of process industry investments so as to incorporate the principles of low and non-waste technology.

The following are a few applications of low and non-waste technology in Finnish industry.

The flash smelting method for copper developed by Outokumpu Oy in the 1930s and 1940s a classic example: the sulphur in the ore is recovered as concentrated sulphur dioxide which is then converted into sulphuric acid. The technique is now used the world over, and whereas Finland accounts for only 1-2 % of the world's copper production, about 30% of the world's copper is produced by the flash smelting method. A corresponding method has been developed for nickel and lead.

Outokumpu Oy has also developed a new ferrochromium production process using an enclosed electric furnace. This permits effective utilization of waste heat and gases and more efficient recovery of the process emissions.

The process is able to use ores of a lower grade than those used in the conventional process.

In the wood-processing industry the sulphite pulp capacity was replaced almost entirely by sulphate and mechanical pulp capacities in the 1960s and 1970s. This coincided with a switch to integrated production processes. The sawdust and timber waste from sawmills has long been used as a raw material for chemical pulp, the mills making almost 100 per cent use of the raw timber material. The bark is dried and used as fuel. The lignin is extracted in pulp processes and concentrated, after which most of it is burnt in a steam boiler. The pulp mills are more than self-sufficient in energy and some of it can be used for paper machines. Most of the process chemicals circulate within the mill, and supplements amount to only a few per cent. New methods have been developed in the manufacture of mechanical pulp (pressurized stone grinding for mechanical pulp production), the aim being to produce not only fibre with strength qualities better suited to market requirements but also savings in raw materials and energy.

Improvements to production methods have enabled water consumption to be, reduced by 30-85% since 1970, depending on the age and the type of the mill. Internal improvements to processes and the building of external treatment plants have led to a reduction of 75% in the solid matter in waste water from mills and of about 50% in the biological oxygen demand.

The integration of food and fodder production has resulted in the almost full utilization of many agricultural products. For example, in the production of starch from grain the overall yield, including by-products, is 99%. In practice the meat-processing industry makes use of all production waste, which is processed into fodder.

A. Ahlström Oy has developed the Pyroflow technique, which is based on the fluidized-bed method and operates without any flame burning. Because of the low combustion temperature no thermal nitric oxide is formed. The sulphur can be extracted by adding limestone to the bed. Owing to the bed's large heat capacity the combustion is stable and is also suitable for the burning of combustible substances with a low heat value. By the end of 1984 there were 24 plants based on the fluidized-bed technique either in operation or under construction in Finland and other parts of the world.

Finland has developed equipment applying the principles of low and non-waste technology with a special view to the needs of developing countries. Examples are Wrede Oy's solar pump operating on solar energy and the distillation process marketed by Rauma-Repola Oy for producing fresh water by exploiting temperature differences in sea water.

Examples of low and non-waste technology applications developed in Finland for use in industry have been published in the report of the ad hoc Committee on Low and Non-Waste Technology (1980), the ECE Compendium on Low an Non-Waste Technology, which was started in the late 1970s, and in a book "Environmental High-technology from Finland" published by the Ministry of the Environment.

6.4.2 Administrative measures for the promotion of low and non-waste technology

Administration

The promotion of low and non-waste technology and all this implies not has been assigned to any particular authority; instead, various tasks are handled by different administrative sectors. In view of the wide field of application of low and non-waste technology and the comprehensiveness of its goals (the implementation of environmental protection and the rational use of natural resources), it would, however, be sensible to coordinate the measures taken by different administrative sectors. So far this has not been done.

The Ministry of Trade and Industry has traditionally been responsible for the development of production technology and energy policy.

In 1983 a Technological Development Centre (TEKES) was set up to maintain and develop technology and technological knowledge. The Centre thus plays a major role in the preparation and planning of Finland's policy on technology. The TEKES provides State aid and loans, particularly for development and experimentation promoting the implementation of new technology.

The Energy Department of the Ministry of Trade and Industry prepares and plans Finland's energy policy, since 1979 in accordance with a programme prescribed by the Council of State. The primary goals of this programme have been to improve the reliability of energy supply, to conserve energy and to produce and use domestic energy. The new energy policy approved in 1983 also makes provision for the goals of environmental protection. Questions related to energy policy are discussed in more detail in chapter 5.

The principal goals of the Ministry of the Environment set up in 1983 in the field of low and non-waste technology concern environmental protection: water management, air pollution control, and the development and supervision of solid waste management and waste utilization. In July 1986 the Council of State made a decision in principle on the promotion of waste utilization. The Ministry also coordinates international cooperation in low and non-waste technology, with e.g. the ECE and the OECD, and bilateral agreements.

A Working Group of government, university, research and industrial representatives was established at the Ministry of Trade and Industry to act as a liaison organ for low and non-waste technology. This Working Group, which has since been transferred to the Ministry of the Environment is to assist in the ECE cooperation, to spread information on low and non-waste technology and to promote the application of its principles in Finland.

The development of various aspects of low and non-waste technology has been entrusted to other administrative sectors, such as the Ministry of Agriculture and Forestry (water and forest resources) and to some extent also the Ministry of Communications (consumption of energy by transport).

The Council of State's report to parliament on science and technology policies states the goals for the development of the administration of low and non-waste technology as follows:

- Cooperation between the authorities and the research establishments furthering research and development in low and non-waste technology should be coordinated, intensified and developed.

Legal and economic instruments

There are virtually no legal or economic instruments, specifically aiming at promoting low and non-waste technology. There do exist, however, numerous measures in the various sectors of low and non-waste technology. A more detailed account of these is given under the relevant headings (chapters 17, 18 and 19) and in the section on environmental economics (chapter 9).

The most important legal instrument is the legislation on environmental protection (Water Act 1961, Waste Management Act 1978 and Air Pollution Control Act 1981). The Water Act covers, in addition to includes regulations aimed not only at water protection, but also at safeguarding the rational use of water resources. The central goal of the Waste Management Act is the utilization of waste and the implementation of environmental protection. Orders may also be issued under the law to restrict exceptionally harmful products (this applies, however, to very few product groups) and the use of certain sales packagings. So far no such orders have, however, been issued. The Air Pollution Control Act aims to prevent pollution of the air and under this law orders may be issued on the composition of fuels, and other related issues. The Finnish forest legislation include the principle of the sustainable use of forest resources (rational use ensuring timber yield). The Planning and Building Act includes a stipulation on energy efficient building. The legislation on environmental protection can be considered to have an indirect influence on the promotion of low and non-waste technology and on the principles of applying the best technology, though there is no specific clause in the acts to this effect.

The TEKES gives financial assistance for research and development as follows:

- grants for research promoting industry;
- product development loans for industry.

Assistance is given on application for the development by industrial undertakings or industrial research establishments of new internationally competitive products and production methods. Preference is given to projects intended to at boost the use of energy and raw material resources and waste, to raise the degree of refinement in production, to develop energy saving products and production methods and to promote labour and environmental protection. Grants may amount to at most 50% and loans to at most 75% of the total costs of the project. The rate of

interest on loans is 6.5 - 8.5% and the repayment period is at most 10 years; the first five years may be repayment-free. The sums reserved for these purposes are shown in Table 18.

Table 18. Funds reserved for grants and loans awarded by the Industrial Development Centre for research and product development.

Aid	1984	1985	1986
		Million FIM	
Grants	90	100	112
Production development loans	105	115	120

The proportion of grants and loans awarded for projects implementing the principles of low and non-waste technology has not been established, but according to an investigation conducted by the Ministry of the Environment in 1984 into industry's financing of environmental protection, such projects accounted for an estimated 5-10%.

From the beginning of 1987 the Ministry of the Environment has subsidized industrial development and experiment projects aiming at waste reduction and recycling. The subsidy can amount to 50 % of the total investment costs.

Other organizations financing research into low and non-waste technology include the Finnish National Fund for Research and Development (SITRA) and the Academy of Finland. A total of 7 million finnmarks has also been reserved for the Technical Research Centre of Finland (subordinate to the Ministry of Trade and Industry) to be used in research projects into low and non-waste technology in 1986-1989.

In 1984, low and non-waste technology was for the first time made one of the 5 main items for research at the Helsinki University of Technology. The University further began a course in this subject in the academic year 1985-86.

Energy conservation investments and the use of domestic energy sources have been promoted by various means, in particular economic incentives. The Ministry of Trade and Industry has provided assistance since the mid-1970s in the form of grants, government loans and interest subsidies. Government security has also been granted for loans. In accordance with the new energy policy more attention is paid to giving assistance to the promotion of new energy-saving technologies and the prevention of pollution in the course of energy production. The Ministry of Trade and Industry has in recent years granted investment aid amounting to a good 30 million finnmarks a year for purposes promoting the use of domestic fuels and energy saving and to the value of about 20 million finnmarks

for the promotion of experimental energy-efficiency measures. Public energy financing has in recent years totalled about 700 million finnmarks. Other sources of financing in addition to the Ministry of Trade and Industry and the TEKES have been the Ministry of Agriculture and Forestry (the National Board of Agriculture), the Ministry of the Environment (the National Board of Housing), the Mortgage Bank of Finland and SITRA.

The main form of government aid for environmental protection investments has been interest subsidy, which is awarded by the Ministry of the Environment mainly for air and water pollution control investments by industry and for projects furthering the utilization of waste. Interest subsidy may also be granted for technical improvements to processes. The economic significance and incentive of subsidies is estimated to be relatively slight. Subsidies amount to less than 10 million finnmarks annually. In addition, local authorities may also be granted about 6 million finnmarks a year in water protection grants. These may also be used for projects promoting the utilization of sewage sludge. The administrative sector of the Ministry of the Environment has felt the need for a grant to be issued by the Ministry for research, development and experimentation in low and non-waste technology.

The main economic sanction is the waste water fee. This is determined primarily according to service water consumption and has been found to reduce the consumption of water. The fee (at present about 3 marks per cubic metre) is levied on properties connected to the municipal water supply and sewer systems. The money effected is used for the maintenance and operation of the network and for waste water treatment. However, the municipal solid waste management fee has not yet been charged in full and so does not at the moment have any effect in reducing waste or promoting its utilization.

For some decades now Finland has had a system based on voluntary agreement of deposits on returnable soft drink, beer, wine and spirit bottles. Disposable containers account for only 1-2% of packagings for these drinks. Towards the end of the 1970s an additional tax was levied on soft drinks packed in disposable containers in order to safeguard the returnable bottle system and to prevent litter. The tax at present amounts to 3 marks per litre on glass and metal containers and 1 mark per litre on plastic containers. The annual revenue from this additional tax amounts to around 10 million finnmarks, though this is not directed at the prevention of pollution by disposable containers or other anti-pollution purposes.

The only funding system so far in use is the Oil Pollution Fund. The oil destruction charge (2 marks per cubic metre) levied on imported oil products is used to support the prevention and combating of oil spills. (For more details see chapter 9.4.4.) A nuclear waste management charge and fund system is presently being prepared.

Waste utilization and measures to promote it are examined separately in item 19.1.4.

6.4.3 Goals for the development of low and non-waste technology

The goals for the development of low and non-waste technology have been stated in the report of the ad hoc Committee on Low and Non-Waste Technology (1980), the Government's Energy Policy Programme (1983), and the Government's reports to Parliament on Environmental Policy (1984) and Science and Technology Policies (1985). Such goals have likewise been included in the decision in principle on the promotion of waste utilization made by the Council of State in July, 1986.

The Government's report to Parliament on Environmental Policy defines the goals as follows:

- The principle of the best technology shall be observed in addition to the Polluter Pays Principle. The users of technology shall contribute towards its development. The most economically feasible technology shall be applied, particularly in designing and building new plants and in modernizing existing plants in order to reduce the exploitation of natural resources and emissions. Modernizing a process is nowadays generally more economical, as regards both environmental protection and finances, than the external purification of emissions. The principle of the best technology also demands that pollution of the environment should not be transferred from one sector to another, such as from the air to water;

- Low and non-waste technology shall be promoted by both the Technological Development Centre and the Ministry of the Environment.

The goals laid down in the report on Science and Technology Policies are:

- Allowance shall be made for environmental protection in various fields of technological development and in the measures promoting it. Attention must also be paid to the after-treatment of existing environmental problems.

- Financial aid for research into low and non-waste technology, and into external purification techniques and product development shall be increased.

- More information shall be supplied on the potential uses of low and non-waste technology.

- Research into environmental protection technology shall be developed and cooperation between the organizations conducting and financing research improved.

- Allowance shall be made in planning measures concerning environmental protection and the development of technology for ways in which these can best be implemented according to the principles of low and non-waste technology.

7 ENVIRONMENTAL LEGISLATION

7.1 An outline of legislation

The development of environmental legislation in Finland has taken place along the same lines as in the other Nordic countries, although differences in the time spans of the enactment of various acts is evident.

A traditional approach was to perceive the pollution of environment as a question of neighbourhood relations, as was initially the case. Not until public health legislation was enacted did the public interest receive any greater attention. The 1960s saw the first attempts at an effective protection of the environment through the enactments of public law. A further common feature of environmental law in all the Nordic countries is the adoption of the rights of common access established by custom, written provisions of law and legal practice as the foundation of recreational uses of nature.

The long traditions in cooperation between the Nordic countries on environmental protection, especially in environmental research, and the similarities in their cultures and social systems are embodied in the Convention on the Protection of the Environment between Denmark, Finland, Norway and Sweden in 1974.

In contrast with most of the Nordic countries Finland has no single, comprehensive environmental law. Environmental legislation is composed of a number of individual acts or secondary regulations or instructions. Each act refers to only one specific sector of environmental protection and takes into account the needs of that particular sector. In addition, such other acts as the Public Health Act and the Planning and Building Act contain occasional provisions on, among other things, noise control, air pollution control and waste management.

The incomprehensive character of environmental protection legislation leads to a variation in the aims, remedies, supervisory systems and permission procedures set out in the individual acts. In particular, the non-uniformity of the permission procedures is a problem, which manifests itself in the relations between various authorities and therefore constitutes an impairment of the rights of the citizens and of those under the obligation of obtaining permission for their activities.

Not only is the law non-uniform but also the penal provisions contained in the particular acts lack uniformity. The current Criminal Code does not recognize the criteria of environmental offenses. Also the penal scales to be applied differ from one another. Some acts, such as the Nature Conservation Act and Pesticides Act, contain inadequate penal provisions and too lenient penal scales. The most commonly provided penal scale is from a fine to a maximum of six months' imprisonment. Recent acts provide for a more stringent penal scale. Examples of these are Air Pollution Control Act and the Waste Management Act, which provide for a maximum of two years and six years of imprisonment respectively.

The number of environmental offenses is small. The offenses are mainly infringements of Water Act or, more recently, of the Waste Management

Act. The small number is in part explained by the haphazard detection of such offenses because of inadequate supervision and non-uniform legislation.

The detection of such offenses would improve through tightened supervision together with a greater appreciation by citizens of the penalties, including seizure and the obligation of redressing what has been damaged, imposed for acts endangering human health or the environment.

The detection is further complicated by problems related to the investigation of environmental offenses and to the determination of liability. Such problems may also hamper or even preclude the proceeding regarding the offence. Another problem is presented by the inadequate liability under law of corporations, which may only be sentenced to pay compensation or to pay a fine subject to certain conditions.

Offenses under the Water Act are particularly complex, because the prosecution of some of them rests with the plaintiff while others may be prosecuted by the public prosecutor. Also, appeal under the Water Act has proved to be a slow and involved process, undermining the rule of law with respect to citizens.

A further particular feature in the regime of environmental legislation of Finland is that resulting from the special status of the Province of Åland. Under the Self-Government of the Province of Åland Act the representative body of the Province exercises provincial legislative powers in matters regarding nature conservation, sanitation and water rights. Consequently, the Province of Åland has a Nature Conservation Act and Water Act of its own. Decisions on the protection of species of flora and fauna are made on the provincial level. The Self-Government Act is, however, undergoing reform at present. It is expected that as reformed, the Act would more precisely delegate the provincial legislative body to exercise its legislative power with respect to environmental protection in general, including air pollution control, the protection of the marine environment and the abatement of marine pollution damage.

7.2 Evolution of environmental legislation

In Finland environmental legislation is longer standing than environmental administration. The oldest act on nature conservation and environmental protection dates from the late nineteenth century, while a number of instructions on the use of the environment and the introduction of environmental changes are even an earlier development. An example of the latter is a decision of the 1638 Diet which, in a compilation of principles from the two preceding centuries governing the establishment of mills, formed the basis of the provisions of the act of 1734 on the construction of mills and on other construction in water. Following the cession of Finland to Russia by Sweden in 1809, Swedish law remained in force in Finland. The provisions on ditching and construction in water embodied the Act of 1734 were not superseded until 1902.

Acts and administrative orders concerning towns figure prominently in the history of Finnish environmental law. During Swedish rule it was considered that fire safety required the regulation of building. This was achieved through the Building Plan of 1734 and the Decree concerning

the Building of Towns of 1856, both of which contained provisions on building materials and building standards as well as on the sites of certain buildings. Reflecting the growth of industry and built-up areas, the Public Health Decree of 1879 contained provisions on pollution control.

The history of Finnish nature reserves may be traced to the year 1803, when an order was issued by the Czar Alexander I that the forests of Punkaharju, a ridge in eastern Finland (some parts of eastern Finland at that time belonging to the Russian Empire), not be logged. In accordance with a Senate decision, the area was purchased by the State in 1840. The State also purchased a number of other areas for the purpose of tourism and nature conservation in the late nineteenth century. In 1880 a proposal was made for the first time that a national park be established in Finland. In 1910 a committee on protection forests proposed the establishment of several nature parks. In addition, the National Board of Forestry gradually began establishing forest nature reserves on the state-owned land under its management, including the present national park of Pyhähäkki, protected by the decision of the Board in 1914, and Malla(tunturi) in Enontekiö, protected by the decision of the Governor of the Province of Oulu in 1916, becoming the first official nature reserve in Finland.

In 1917 the Societas pro Fauna et Flora Fennica proposed to the Senate that a Nature Conservation Act be prepared. The Act, still in force, was promulgated in 1923. It protects several species of birds together with some other animals as well as rare species of plants. It also contains provisions with a view to promoting landscape protection. The supervision of nature conservation was entrusted with a special official.

With economic expansion and the growth of built-up areas, additional legislation became necessary in order to regulate the relations between neighbouring areas, to ensure continued industrial activities as well as to protect the interests of neighbouring landowners. The problems of air pollution had been addressed relatively early, both in the context of fire safety and in that of public health and sanitation. The development now took place in two separate fields. In the field of private law, provisions on neighbourhood relations, including a prohibition against immission, were incorporated in the Neighbourhood Act, which entered into force in 1923. In the field of public law, provisions on environmental protection were contained in building and public health legislation. In 1927 a new Public Health Act was adopted, which afforded municipalities greater authority to act where environmental issues were concerned. This dichotomy in environmental law and legal practice exists to this day, manifesting itself in debates as to whether it is for a court or an administrative authority to issue permits.

Another act passed in the 1920s was the Private Forest Act, which superseded the Decree of 1917 concerning the Prevention of Damage to Forest. Several proposals were also made in the 1920s to revise the permission procedure for the use of water by following the Swedish model and establishing water right courts.

While certain major environmental acts were promulgated between the early 1920s and the late 1930s, it was the expansion of industry and construction of power plants to satisfy the needs of power production,

as exemplified by the harnessing of the waterfalls of Imatra[1] in the 1920s, rather than the progress of nature conservation that characterized the period. An example of the prevailing mood was the delay in the establishment of nature reserves: despite a promising start the first **Act on the Establishment of Nature Reserves on State-owned Land** was not passed until 1938. Four national parks and six strict nature reserves were established under the Act, but three of them were located in the eastern and south-eastern part of the country and were, consequently, lost to Soviet Union after the war in 1940.

Legislation passed in 1950s includes the **Atomic Energy Act** and the Act **on Protection against Radiation** which are, broadly speaking, also aimed at environmental protection.

In the early 1960s environmental hazards grew dramatically, one reason being that the most productive branches of industry, such as the wood-processing industry, were also the greatest sources of pollution. This had a particular impact on water. Consequently the **Water Act** was adopted at the beginning of the 1960s, at a time when Water Right Courts were finally introduced after years of preparation. While the Water Act is not purely aimed at environmental protection in its premises and objectives, it remains with its subsequent amendments a central code of environmental law.

In 1965 a new Public Health Act and Public Health Decree were passed, which contain provisions on the quality of drinking water, waste management, sewerage, air pollution control, noise abatement as well as the siting of installations with health hazards. The provisions are primarily aimed at preventing health hazards but also play a central role in the supervision of environmental protection. The same applies to the **Planning and Building** Act, which covers town-planning and the supervision of building.

Other acts passed in 1960s were the **Act on the Protection of Historic** Buildings, the **Ancient Monuments Act**, the **Act on the Prevention on the Pollution of the Sea**, the **Poison Act**, and the **Pesticides Act.**

In order to improve the combatting of oil pollution damage new acts were passed in the 1970s. They are the **Act on Prevention of Oil Pollution Damage on Land** and the **Act on the Prevention of Pollution of Waters from Ships** which superseded an earlier act. Other acts passed in the 1970s include the **Outdoor Recreation Act.** Restrictions on the cross-country use of motor-powered vehicles were incorporated in an act and similar provisions regarding boats in another act. An important development was the entry into force of the **Waste Management Act.** Earlier, a **Vehicle Junks Act** had been adopted.

The most important legislation passed in the 1980s include the **Soil Materials Act**, the **Air Pollution Control Act** and the **Building Protection Act**, which superseded the earlier **Act on the Protection of Historic Buildings**, as well as provisions on hazardous waste incorporated in the Waste Management Act. The **Act on the Development of Archipelagic**

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1) Imatra is one of the most magnificent waterfalls in Europe. Its head is 25 m and medium flood flow around 720 m^3/s.

Areas partly relates to the protection of the environment in safeguarding the archipelagic landscape and nature from environmental hazards.

Amendments to the **Act on the Prevention of Pollution of Waters from Ships** and to the **Act on Prevention of Oil Pollution Damage on Land** came into force on 1 November 1985. The amendments are aimed at defining more clearly the responsibilities of combatting oil pollution damage and procedures for compensation.

In nature conservation, an **Act on the South-western Archipelago National Park** and an **Act on the Urho Kekkonen National Park** as well as an **Act on the Special Protection of Ounasjoki** were promulgated and entered into force in the early 1980s.

7.3 Permission procedures and supervision

7.3.1 General principles governing environmental protection

In the preparation of environmental legislation as well as in permission procedures and other administration of law certain principles for the public good are followed, which are designed to ensure the ecological balance in nature and the diversity and regeneration of it.

The **principle of sustainable growth** aims at such a use of natural living resources as not to endanger their regeneration. In the legislation regulating fishing this principle finds expression in the obligation imposed in the owner of the fishing waters to arrange for the fishing and management of his fishing waters in such a manner as to ensure the preservation of the fish and crayfish stocks. The principle is also reflected in the provisions on the fishing season and the smallest allowable size of the fish to be caught. Similarly, hunting must not endanger the preservation of the game.

Another reflection of the above principle can be seen in the **Forest Administration Act,** which assigns the forest administration the task of promoting forestry in such a manner as to secure a sustained and economically advantageous growth of timber production and the greatest possible productivity of the soil.

The **principle of multiple use of natural resources** means that it must be possible to use a forest, a water area or other resource simultaneously for more than one purpose. While this principle is as yet not fully embodied in legislation, some examples of it can already be found in some acts, such as the Water Act.

Another principle is the **principle of anticipatory action,** which illustrates the idea of the most effective means of achieving the objectives of environmental protection. The principle is manifested in the provisions that place those engaged in harmful activities with environmental impact under the obligation of taking measures to prevent any harmful effects, such as the pollution of air and water.

The **principle of the re-use and recycling of waste** is perhaps the one that has explicitly found concrete manifestation in legislation explicitly. This principle is aimed at arranging the waste management in such a

manner as to put the waste to the best possible use and to avoid any harmful effects on the environment.

7.3.2 Controls

In order to control environmental protection, legal and economic means are used. The legal controls embodied in environmental legislation, such as those based directly on law and regulations to be issued in virtue of the law, are designed to prevent and to minimize the effects of activities which pollute or have harmful effects on the environment, including human health.

Some of the most typical legal controls are norms and prohibitions, procedures for obtaining permission or giving notification as well as obligations to submit plans for approval and to provide information. Economic controls include tax concessions, fees, grants, loans and interest subsidies. At present few economic controls are incorporated in legislation. An ad hoc committee set up to study their importance and the means to improve them. The work of the committee is expected to be finalized by the end of 1988.

7.3.2.1 General norms and prohibitions

In Finland land and water together with their natural resources are as a rule privately owned. The owner does not, however, have an unrestricted or sole use of them. They may also be utilized by others. In order to restrict the rights of the owner legislation contains provisions of two kind to prohibit a particular use of an area, a resource or an installation. One set of provisions confer rights on other persons to use the privately-owned resources; this is called the right of common access. Another set of provisions consists of environmental prohibitions.

Finnish environmental law contains norms of two kind. Some legal norms define to what extent an activity may be pursued subject to permission; such norms are illustrated by the prohibition to pollute waters as defined in the Water Act as well as by the prohibition against immission contained in the Neighbourhood Act. Other norms prohibit the creation of a specific environmental implication in all cases. The latter could be termed absolute prohibitions, because they define the environmental values which in no case may be undermined. Such prohibitions are embodied in water and public health legislation. The absolute prohibition contained in the Water Act protects public health, the natural environment and human settlements. Public health is aimed, inter alia, at preventing any environmental risks to human health.

7.3.2.2 Notification and permission procedures

Notification and permission procedures have a central supervisory and controlling role in current environmental legislation. The notification procedure means that authorities must be notified in advance of a particular activity. The purpose of the procedure is to afford the supervisory authority an opportunity to review the details of the activity and, as necessary, to impose conditions on it. The notification procedure is often

complemented by the permission procedure: an activity requires prior permission of the authorities.

Owing to the lack of comprehensive legislation, the notification and permission procedures are many and varied. The most important procedures for the protection of air, water and soil can be found in the Planning and Building Act and the Planning and Building Decree, in the Decree on Preliminary Measures for Preventing Water Pollution, in the Act on the Prevention of Marine Pollution, in the Air Pollution Control Act and the Air Pollution Control Decree, in the Public Health Act and the Public Health Decree, in the Poison Act and the Pesticides Act as well as in the Neighbourhood Act.

Environmental legislation also provides for an obligation to prepare plans. The Soil Materials Act provides that a plan must be submitted for approval before a permit may be issued. The Waste Management Act requires the holder of the property to submit a plan detailing the arrangement for the disposal of waste from the property.

The incorporation of planning in the administrative permission procedure is not a recent development. The Water Act and the Water Decree supplementing it, for example, require that applications must in all cases be accompanied by plans. In such cases the plan is used as a means of control and supervision equivalent to the actual permit. The statutory plan becomes part of the conditions and requirements established in the permit to be issued by the public authorities, and becomes binding after the issue of the permit.

Building Supervision and the Protection of Buildings

The Planning and Building Act stipulates that a permit issued by the municipal Building Board is normally required for all building, including re-building. When considering an application for a building permit, the Building Board must ascertain whether the building to be erected conforms to the local town or building plan as well as to any other building rules and regulations. Among the environmental implications to be considered are whether the building is suitable for the site, whether it is well-proportioned and whether it fits to the neighbourhood. The Building Board may invite comments, as necessary, from authorities, such as the municipal Health Board.

A prohibition against any development may be imposed on a property for which a town plan, building plan or shore plan exists. The prohibition means that no trees may be felled and no excavation, levelling out, filling in or similar activity may be performed on the property without permission of the local government. When considering an application for excavation the local government must observe the provisions of the Soil Materials Act.

The Planning and Building Decree contains a prohibition against immission, stating that no installation may be erected on a property (real estate), if it causes permanent harm to the property or those living in the vicinity. The harm may include smoke, soot, ash, sparks, heat, smell and gasses. The Building Board must take such implications into account when considering the application. It must also ascertain that heating plants, stacks

and exhaust air uptakes allow for the prevention of the harmful effects of smoke and gasses in an appropriate manner.

Applications to protect buildings in an area where no plan exists or where a prohibition against building has been issued are considered by the Provincial Office. A decision on the protection of a building must be submitted to approval by the Council of State.

The Neighbourhood Act: Prohibition against Immission

The most important provision in the Neighbourhood Act is that prohibiting immission. The provision stipulates that a warehouse or a plant may not be kept or any other premises used in such a manner as to cause a neighbour or any other person who has an interest in the matter permanent and unreasonable harm owing to smoke, soot, ash, sparks, steam, heat, smell, vibration or banging. Such immissions are prohibited only where their harmful effects are permanent and unreasonable. Harmful effects are not unreasonable in cases where under the local circumstances they cannot be considered nondeliberate or unexpected or where they preceded the neighbourly relationship.

However, if a person wishes to construct a warehouse or a plant which may have one or more of the above effects, he must apply to the municipal Building Board for a permit stating the minimum distance between the plant and the neighbour. The Building Board must refer the matter to the Provincial Office in cases where the harmful effects of the plant would cover a large area. As of 1 October 1986, the municipal Board for Environmental Protection or any other local authority assigned with the responsibilities of such a Board must be given an opportunity to present its views on the matter. A typical feature of the Neighbourhood Act is that the application for the permit is left at the discretion of the operator of the plant. Failure to submit an application carries no penalty under the Neighbourhood Act but may lead to the closure of the plant. Before a permit is issued, a public inquiry is conducted whereby the parties involved may express their views. When considering an application the authority must take into account the harmful effects of the activity on health, nature, objects and the amenities. The permit may not impose any actual conditions or obligations on the applicant with respect to the protection of the environment. Instead, the authority must ascertain whether the natural conditions and other features of the site lend themselves to the activities carried out by the plant and whether such a plant already exists in the area.

Permission Procedures under Public Health Legislation

The Public Health Act provides for two permission procedures: one for the sites of industrial activities or warehousing in a residential building and the other for the sites of plants or warehouses with health hazards in general. Unless the site is assigned in a (legally) confirmed town or building plan to the purpose in question, a plant or a warehouse as defined in the Public Health Decree may be sited only in a place approved by the municipal Health Board on applications. Permission is also required for the assignation of areas to activities which create a lot noise, such as shooting ranges.

An application must be accompanied by information on the suitability of the intended site with a view to housing, recreation and other considerations. For a site to be approved it must be suitable with respect to such considerations as the nature of the activities of the plant, noise control, risk of the pollution of water and air as well as the population in the area.

Public health legislation contains no provisions on whether and what kind of conditions can be attached to the permits for the siting of plants. In practice it is considered that the municipal Health Board may attach conditions regarding environmental protection to the siting of a plant or a warehouse as well as require the operator to monitor the environmental implications of his activities. Therefore the Health Board previously had extensive powers to intervene in order to avoid envi-ronmental hazards through the permission procedure. Recently the powers of the Health Board have been reduced in cases involving air and water pollution, which are in the main considered under the Water Act and the Air Pollution Control Act. In cases relating to water pollution, the powers of the Health Board extend only to human health aspects, and where sewage is concerned, only to the effects of sewage conducted to the public sewerage. With respect to air pollution, the Health Board may no longer attach conditions to the siting of plants that under the Air Pollution Control Act require notification. As regards any other plants the Health Board retains authority over air pollution control issues and any conditions relating to them.

Permission Procedure under the Water Act

The Water Act contains very specific provisions on a permission procedure based on prohibitions against the closing off, altering or polluting of waters. Permission from the Water Rights Court is required for any activities resulting in non-compliance with the prohibitions. The permission procedure is supplemented by a notification procedure covering a large number of cases. The notification procedure places plants using certain hazardous substances as well as a number of other plants specified by decree under an obligation of notifying the National Board of Waters and the District Water Office respectively of their activities well in advance of the starting date.

Before any permit can be issued, certain requirements, conceived in different ways and concerning both public and private interest must be fulfilled. No permit may be issued where the activities would endanger public health, cause perceptible and harmful changes in the environment or seriously affect living conditions or commercial and industrial operations.

If the assessment of the facts shows that it is possible to issue a permit, the Court will do so, as well as confer on the applicant any rights related to the activities, while imposing obligations on him in the form of conditions which he must fulfill and which concern measures designed to adapt this particular use of water to the other uses, both with a view to public and private interest. Sewage discharge permits are normally issued for a given period of time, and they may be subsequently revoked, as stipulated in the law. The conditions imposed in them may also be revised.

When issuing a permit the Court also determines the amount of compensation to be paid in case of damage. Compensation must be paid for any damage for the prevention of which the conditions laid down when issuing the permit could not stipulate any measures.

If the right of redemption or use of land owned by another person is bestowed on an applicant, the ensuing loss is generally compensated one and a half fold. Where construction projects in water are concerned, fees may be imposed, including those for the regulation of water and those for the conservation of fish stocks.

Some of the commonly imposed conditions or requirements in permits for the discharge of sewage concern:

- The allowable waste load and the required treatment

  for municipalities

  - restricted total quantity of sewage
  - maximum quantities of organic substances and phosphorus to be allowable in sewage
  - disinfection of sewage
  - unexpected release into sewerage of substances not normally discharged
  - further treatment and disposal of sludge

  for industrial plants in wood-processing

  - restrictions on the maximum quantity of suspended solids, organic substances and toxic compounds
  - decreased quantities of nutrients
  - treatment of sanitary waste

- Maintenance of treatment facilities
- Monitoring of the quantity, quality and effects of sewage
- Management of fish stocks
- Other measures for the prevention of damage
- Compensation for damage
- Validity of the permit and reapplication

As regards construction projects in water , additional requirements are in practice imposed under the provision on building standards embodied in the Water Act.

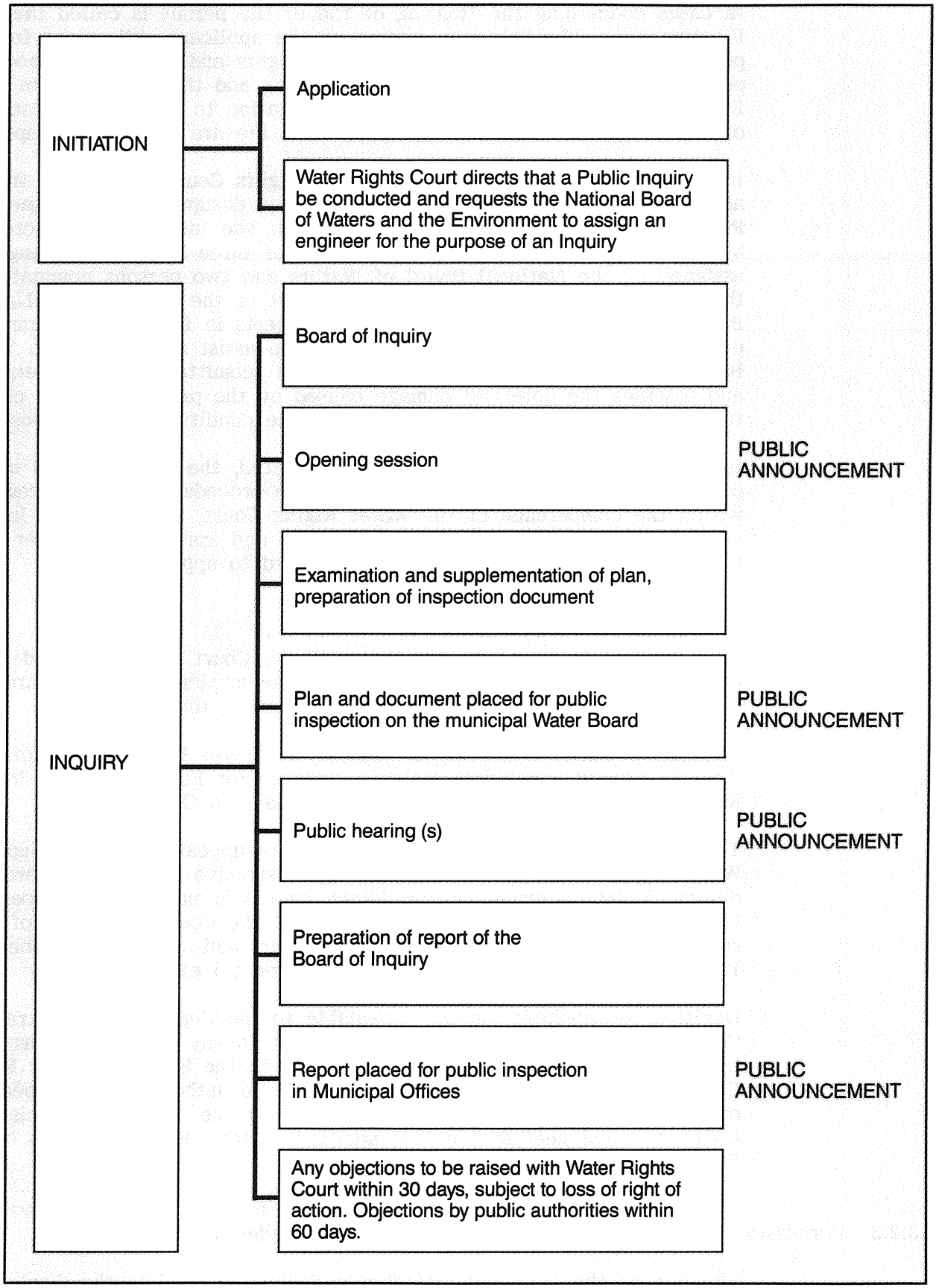

Figure 19. Public inquiry.

In cases concerning the floating of timber the permit is called the Floating Rule. The Rule may impose on the applicant obligations to perform certain measures to protect the rights and interests of another person or to minimize the damage to fishing and the amenities. In the Floating Rule for unbarked timber an obligation to monitor the condition of water together with a water protection fee are in practice imposed.

In cases of great importance the Water Rights Court may direct that the application be submitted to a Public Inquiry, designed to assist the Water Rights Court in its decision-making process. The Inquiry is conducted by an ad hoc Board of Inquiry consisting of three members: an engineer assigned by the National Board of Waters and two persons nominated by the municipality in question. At the request of the engineer the National Board of Waters may assign one of its experts in fish biology, limnology, process technology or landscape planning to assist at the Inquiry. The Board of Inquiry examines the project plan submitted by the enterprise and assesses the potential damage caused by the project. It also clarifies the legal requirements for a permit and the conditions to be imposed.

In cases where no Public Inquiry is conducted, the application is made public through a Public Announcement. The procedures in other cases within the competence of the Water Rights Court, such as those involving disagreements, offenses, complaints and assistance to other public authorities, are different from those applied to applications.

The Right of Appeal

It is possible to appeal to the Water Rights Court against most decisions, excluding those on supervision, taken by the municipal Water Board. Details on the appeal procedure are included in the decision.

Finland has three Water Rights Courts: the Water Rights Court for Western Finland located in Helsinki, another for Eastern Finland in Kuopio, and still another for Northern Finland in Oulu.

The decisions of the Water Rights Court are appealable to the Superior Water Rights Court or the Supreme Administrative Court. As regards disagreements, offenses, or complaints, appeal is made to the Superior Water Rights Court, which is a chamber of the Court of Appeal of Vaasa, reinforced by one or more Engineer Members and as of 1 December 1987, by one Member representing environmental expertise.

Decisions on applications are appealable to the Supreme Administrative Court. It reviews the decision with respect to any other questions except those of compensation, which are referred to the Superior Water Rights Court. Decisions on assistance to other public authorities are appealable only to the Supreme Administrative Court. At the Supreme Administrative Court, two Engineer Members in addition to the regular Members of the Court assist in the proceedings.

7.3.2.3 Permission procedures and notification procedures under other legislation

The **Act on the Prevention of Marine Pollution** prohibits the discharge of waste or other matter or energy from a vessel without permission. Permission to discharge within the Finnish territorial waters is granted

by the Water Rights Court and to discharge beyond the Finnish territorial waters by the Council of State.

The **Waste Management Act** places the holder of a property (real estate) under an obligation to prepare a waste management plan, if he is the person responsible for the disposal of waste and if hazardous waste or waste of unknown composition is handled or generated on the property. Such a plan must be approved by the Municipal Waste Management Authority which is, as of 1 October 1986, the Board for Environmental Protection or, where the Ministry of the Environment so directs, by the Provincial Office.

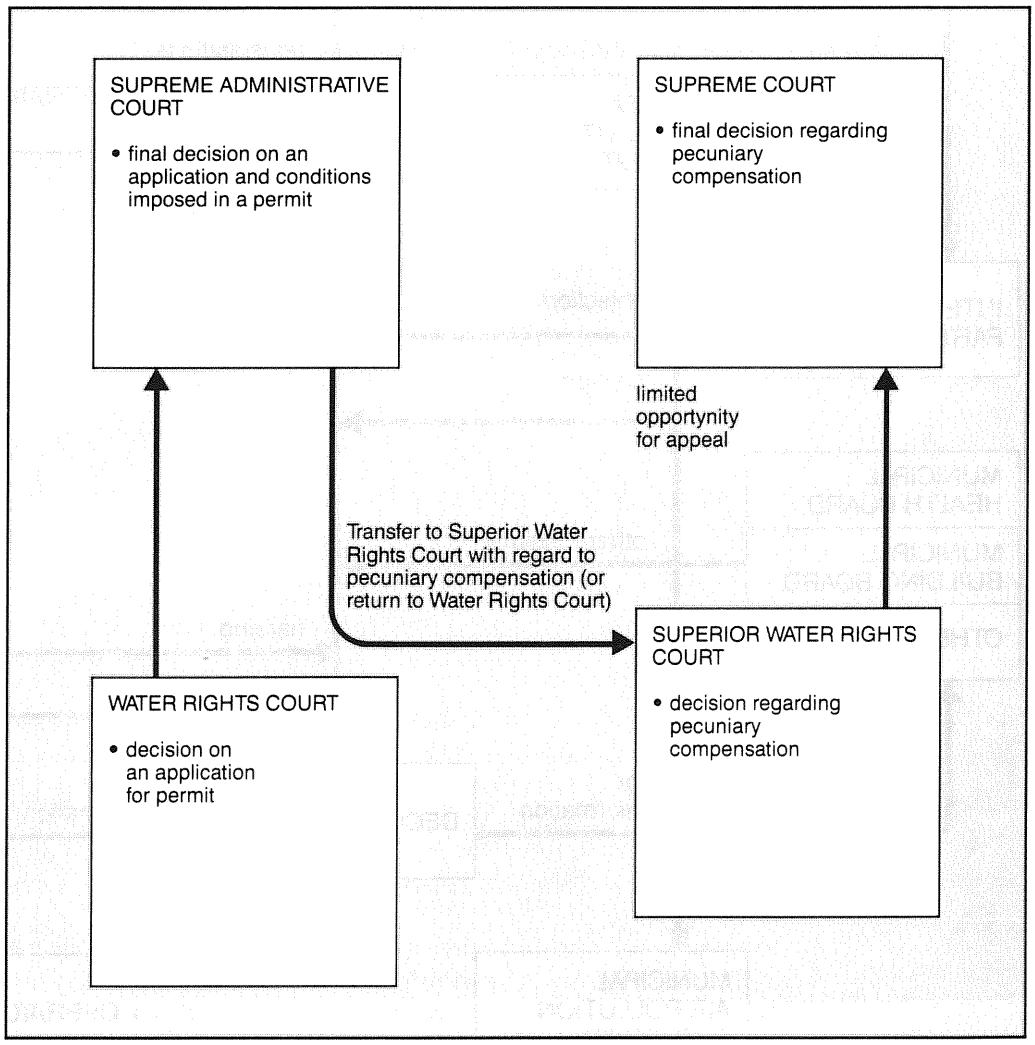

Figure 20. The most commonly used appeal procedures regarding applications to permissions.

The holder of a property must give a notification to the municipal waste management authority or the person responsible for waste treatment sites in cases where hazardous waste or waste of unknown composition is stored or generated on the property.

The general rule is that the treatment of hazardous waste requires a permit issued by the Provincial Government.

A notification thirty days prior to the import and export of hazardous waste must be given to the Ministry of the Environment, which may issue a prohibition against such import or export.

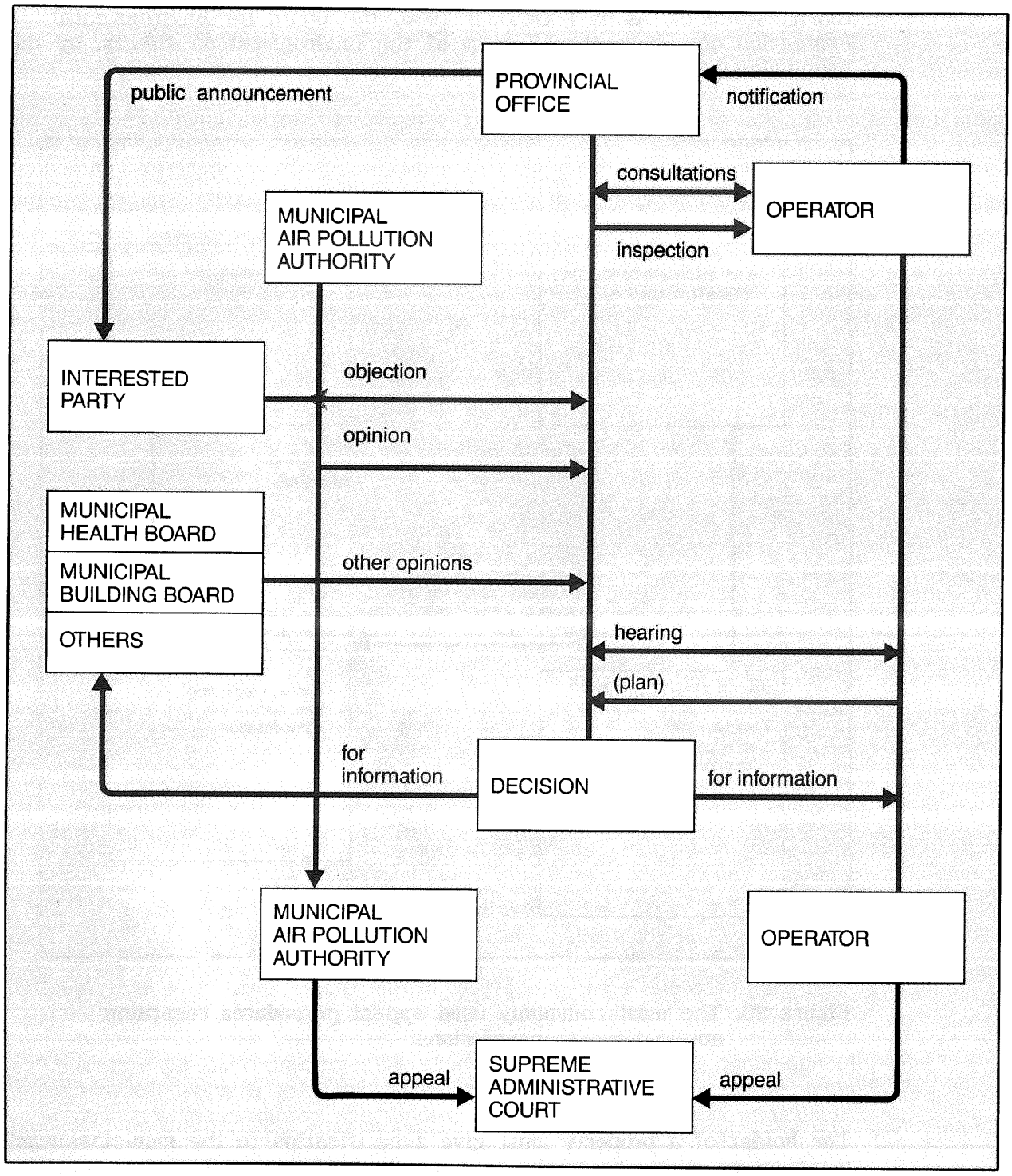

Figure 21. Notification procedure in air pollution control.

Waste management legislation and administration are discussed in greater detail in chapter 19.2.

Under the **Poison Act** the production of and trade in toxic substances is subject to a permit. Depending on the quantity and toxicity of the substance, a production permit is issued by the State Technical Inspection Centre or the Provincial Office. A trading permit is issued either by the Municipal Health Board or the Provincial Office, depending on the toxicity category of the substance.

Permits required under the **Pesticides Act** are issued by the National Board of Agriculture. Still another permission procedure is that provided for in the **Soil Materials Act.** A permit to extract soil material is issued by the Municipal Board, in some cases subject to confirmation by the Provincial Office.

The **Air Pollution Control Act** does not provide for a permission procedure proper, whereas the Air Pollution Control Decree prescribes a notification procedure for specified plants that have special significance for air pollution control. The notification procedure applies to plants already in existence at the time of the entry into force of the Decree, which number approximately 1,300, as well as to new plants. The notifications are considered by the Provincial Office, which also takes a decision of them. The decision may contain obligations, which in practice amount to conditions laid down in a permit. The stage-by-stage consideration of a notification is illustrated by the chart below. Air pollution control legislation and administration are discussed more fully in chapters 18.2 and 18.3.

7.3.3 Future development of the permission procedure and the notification procedure

The current permission procedures and notification procedures in environmental protection lack uniformity and do not provide full coverage of all instances where protection is required. The need to codify and standardize the procedures has been emphasized in several contexts, most notably in the Government Report on Environmental Protection, submitted to the Parliament on 28 September 1984. The report sets the objective of establishing a comprehensive and uniform permission and notification procedure to ensure the prompt consideration of cases and to safeguard the public and private interests as well as the rule of law with respect to society as the guardian of the public inter-est, the affected parties and the entities concerned for the protection of invaluable environmental values on one hand, and those submitting ap-plications or giving notifications on the other hand.

A further problem is the variety of forms that a permission may take. An example is the Public Health Act, which provides for a permission procedure for the site of a plant or a warehouse, while the Waste Management Act provides for a waste management plan for a similar plant or warehouse. The Air Pollution Control Act provides for a notification procedure, which is comparable to a permission procedure in the sense that conditions similar to those attached to permission may be attached to the decision to be taken with respect to the notification. However, under the Air Pollution Control Act no permission is required for the start-up of a plant.

Until the 1960s the permission procedures in environmental protection were based on the concept of concessions regulating private interest. The interest of the concessionaire were regulated in relation to other private interests, including those of the neighbours. This interpretation of the Neighbourhood Act of 1920 remained till the 1970s when the Supreme Administrative Court explicitly revised the interpretation. At that time the notion of the protection of the environment as an object of legal protection gained more ground. This contributed to a change in the interpretation of the Neighbourhood Act. In the interpretations of the Water Act of 1962 and the Public Health Act of 1967 the safeguarding of the public interest has gradually gained importance. In more recent legislation, including the Waste Management Act, Air Pollution Control Act and Soil Materials Act, the emphasis is laid specifically on the safeguarding of the public interest. The Air Pollution Control Act does not even afford private citizens or corporations the right of appeal, a circumstance admittedly considered a major weakness of the Act.

In Finland property is firmly protected under the Constitution, generally spoken to a greater extent than in market economy countries on the average. This means that the enactment of any legislation considered to affect proprietary rights must follow a procedure which requires a majority of two thirds in the Diet in two votes, taken with Parliamentary elections in between. If declared urgent by a majority of five sixths, the act may be adopted by one vote.

Permits necessitated by considerations of environmental protection in practice involve the restriction of proprietary rights, i.e. an unlimited use of private property. One interpretation has even been that an obligation to apply for a permit may imply the transfer of property from the owner to the State without any compensation being paid. Nevertheless, acts containing a permission procedure for the purposes of environmental protection have been adopted by simple majority. This also applies to the Soil Materials Act, the most controversial act to date. The adoption by simple majority of acts providing for permits to control emissions has been in dispute to a lesser degree than in cases where permits to restrict the use of natural resources have been involved. The question of majority and the related question of compensation will present substantial problems for the adoption of an Rapids Conservation Act, long in preparation and aimed at prohibiting the utilization for power production of nearly all the unharnessed watercourses, with the exception of the border rivers between Finland and Sweden and those between Finland and Norway. Another illustration of the same problem is the lack of an effective set of rules to govern the protection of coastline and lake and river shores.

The principles guiding the consideration of applications for permission are normally of two kind. On one hand there is the legality principle, which in its purest form means that consideration is strictly based on statutory norms. On the other hand there is the expediency principle, meaning that, as in granting concession, free discretionary powers may be exercised. In actual fact the distinction between these two principles becomes less clear-cut, and both principles may be applied to same case. Flexible norms are used, which do not prescribe a specific decision. It is considered that the legality principle may and must be applied to determine whether the activity referred to in the application is

"appropriate", "necessary" or "reasonable", or whether "special grounds" exist to grant the application or whether this would be in violation of the "public interest" as well as whether the activity would have "substantial" harmful effects.

As a rule the grounds as prescribed by environmental legislation for decision-making are reasonably precise. In principle the grounds should be capable of being assessed on the basis of the law. The most important aspect of such grounds is a comparison of interests. A public authority is in all cases under the obligation to compare the implications of his decision with the objectives to be achieved. He must compare the state of the environment and the need for environmental protection from the viewpoint of the public interest with the cost and the technical feasibility of pollution control measures from the viewpoint of the private interest. The benefit to be derived from the economic activities may also be a factor in the comparison of interests, as provided in the Water Act and elsewhere.

Factors affecting the extent of the discretionary powers of a public authority include the type and the rank of the authority. In such complex systems as that for air pollution control the municipal Health Board takes decisions in a permission procedure under the Public Health Act on the sites of smaller plants, whereas the Provincial Office considers the cases involving plants with substantial emissions in a notification procedure under the Air Pollution Control Act. A municipality (Municipal Board) takes decision on applications for permission to extract soil elements, but must submit its decisions to the Provincial Office for confirmation. To cite a further example, it has been proposed that Parliament take the final decision on the construction of a nuclear installation.

Due to the lack of uniformity in the environmental permission and notification procedures, an activity requiring a number of permits is not allowed until each permit has been issued and has become valid. Procedures are further complicated by some permits being interconnected. An example is the Building Permit provided for in the Planning and Building Act which may not be issued until the siting has been approved under the Public Health Act or until permission of the Water Rights Court has been granted under the Water Act, where required by these Acts. In addition, a decision taken in one case is not binding on the authority in another case. In most cases with extensive environmental implications the authorities in actual fact make every effort to pay heed to all conceivable effects of the activity concerned, but such an effort is undermined by the lack of uniformity characterising the permission procedures and the entire environmental protection organisation.

The conditions imposed on the applicant in the permit form part of the decision, but are considered separate from it in the sense that there is the possibility of a separate appeal against them. In some cases the authority to impose conditions is provided for by law, while in other cases it is not and such authority is nevertheless interpreted to exist. An example of the latter is the Public Health Act: permits for siting approved under it are, in most cases, issued subject to conditions. The conditions will naturally have to control health hazards and not harmful effects on the flora, buildings or the like. Another example is the

building permit, to which conditions for the purposes enhancing amenities may be attached.

Legislation normally provides for unlimited validity of permits. At present, however, permits for the discharge of sewage are issued for a given period of time. Where the conditions of the permit are called into question, this is due to changed circumstances: either an amendment of law or a revision of the interpretation of law, or else a change in activity. The validity of an existing permit may be restricted by the authorities issuing additional regulations.

Where an application is refused, a new application may be submitted. The parties must be heard if, due to the failure to observe the conditions laid down in the permit or for other reason, a decision is to be taken on the revocation of the permit or the suspension of activity which is subject to permission.

7.4 Planning and the assessment of environmental impacts

Environmental impacts normally receive no particular attention in large-scale or long-term goal setting and action planning, nor in the preparation of such programmes as the programmes concerning national economy. The assessment of environmental consequences is not a statutory obligation in such activities. The planning processes in public administration, among other those on the local and regional levels, need to accommodate a host of conflicting needs and goals. The assessment of environmental implications has not so far become a regular feature of such processes either.

There are, however, cases where acts in the planning of minor projects within public administration are based on a statutory obligation or on a practice established by an authority. Some examples are projects concerning roads and railways and water-use projects. In Finland the assessment of environmental impacts as a part of planning process is in the main only made use of in land and water use and in individual projects. Practice may vary from sector to sector, and various public authorities may issue their own recommendations and instructions on such assessments. There is variation also in the type and scope of the assessments, as well as in the procedures for participation by the parties concerned. In physical planning the assessments often remain on the level of inventories, merely taking stock of the prevailing state of the environment.

In particular, the plans for individual projects and for larger areas prepared within public administration are characterized by duplication and discrepancy. An area may be the subject of planning by a number of authorities with differing viewpoints. Examples of such problems are the conflicts between peatland conservation and the harvesting of peat as well as those arisen in the planning of the uses of land and water. The sectoral planning referred to above complicates not only the assessment of all aspects and effects of a project to be sited in a particular area but also the preparation of any plans for the optimal use of the area.

Similarly as any other provisions on environmental protection, the provisions on the assessment of environmental impacts of projects

leading to changes in the environment are embodied in the number of different acts and lower-category regulations. The disintegrated nature of the provisions results in a division of the decision-making processes between a host of authorities and courts of law, with each authority and court assessing the implications of its own field. This creates problems not only for those subject to environmental hazards but also for those responsible for carrying out the projects concerned.

Furthermore, activities leading to changes in the environment are often subject to permission of public authorities or courts, or notification to the authorities. In many cases an application for a permit must be accompanied by an assessment of the environmental impacts. The conditions attached to the permit may include obligations on the applicant to monitor the effects of the activities. In practice the applicant may not always have adequate resources to make an extensive and objective assessment as required by the decision-makers.

Environmental considerations are a relatively recent addition to the Finnish social development policy, and as yet insufficiently and haphazardly integrated in the preparation of legislation and the work of Government committees. The past few years have, however, seen favourable changes in the general attitude, with the continued efforts by the Ministry of the Environment to improve the criteria for the assessment of environmental impacts with a view to their adoption. A more detailed description on environmental impact assessment follows in chapter 10.

7.5 Public participation

A number of permission and notification procedures applied in the environmental protection provide for a subsequent public participation, most importantly for a right of appeal.

In recent years several studies have been made to find new ways of improving public participation and the rule of law with respect to citizens. Such studies include the reports of the ad hoc Committee on Legal Security in Public Administration (1981) and the ad hoc Commission on Public Participation (1980). Improvements have been made through legislation. A partial reform of the Access to Public Documents Act has been undertaken and the Administrative Procedures Act was promulgated in 1982. In addition to enhancing the rule of law, the latter Act seeks to improve the quality of administrative services. Among other things, the Act places the authorities under an obligation to supervise administrative measures and to notify the parties concerned that a case is under consideration. The Act also stipulates that the decisions must be comprehensible and state the reasons for any decisions.

The right to be heard is in the main bestowed on a person or a corporation in cases where the decisions taken in an administrative procedure have an immediate effect on the person's or corporation's right or alters his rights, obligations or legal status. Cases where the right to be heard is extended to other persons or corporations are exceptions from this rule.

Some acts, including the Planning and Building Act, Neighbourhood Act and Water Act, provide for hearing of specified persons or corporations

before any decision may be taken, but for the most part the right to be heard and the right of appeal are restricted to the parties in the strictest definition of the term as well as to a defined geographical area. The practices based on different acts vary to some extent.

The Planning and Building Act which regulates land-use planning provides that both in the preparation of a general plan and of a detailed plan the landowners and others concerned must, as necessary, be given an opportunity to express their views. The legislation also stipulates that a proposed plan must be open to public inspection and that those having an interest or a right to protect be afforded an opportunity to object to the plan.

The Planning and Building Act confers the right to participate in the planning process only to the landowners or holders of a property (real estate). No one else needs to be heard. Likewise, the right of objection is afforded to the owner or holder of the property or the holder of some special rights. In practice, however, also the objections made by other persons are considered.

Public participation in land-use planning is undermined by the passive nature of the provisions governing the right to be heard; in order to be able to exercise the right citizens must actively seek it. The overall reform of the Planning and Building Act presently under consideration aims at improving public participation.

The Neighbourhood Act enables a substantially broader participation than what is normally the case. The Act affords the right to appeal to all those who own land or flat in the vicinity or whose interest may be otherwise affected. The immediate effects of an activity are considered to extend to a larger area than what is the case in building matters in general. The extent of the right of appeal varies depending on the grounds of the appeal. The most extensive right of appeal exists in cases where the grounds of the appeal lie in a harmful effect which is due to air pollution or noise and which covers a large area.

In the permission procedure for water matters the parties are afforded an opportunity to be heard on several occasions. Following the submission of the documents pertaining to the matter it may be supplemented by additional information and the parties will be heard. As noted above, the Water Rights Court may direct in cases of major importance that an application be submitted to a Public Inquiry, designed to assist the Water Rights Court in its decision-making by arranging for the hearing of the parties and the inspection of the area concerned.

The Inquiry begins with an opening session (see figure 19), providing the interested parties with an opportunity to express their opinions on the project. Following the opening session, an ad hoc Board of Inquiry assigned to conduct the Inquiry examines the plan for the project, assesses the nature and extent of potential damage and considers whether permission may be granted and on what condition. After the examination of the plan it is put on display for a specified period. Thereupon a public hearing is conducted where the parties may make comments and call for further studies. The hearing is completed with a report prepared by the Board of Inquiry, to be put on display in the Municipal Office to allow for comments or objections. On closing the case the Water Rights

Court issues a written decision which is made known to the parties in a manner specified in the Water Act. Thereupon the parties may appeal against the decision (for appeal procedures see figure 20).

The most recent and extensive partial reform of the Water Act has been under consideration for more than ten years and has been in force from 1 December 1987. The reform mainly seeks to ensure the prompt and effective consideration of applications through introducing modifications of the procedures for the Public Inquiry and the Water Rights Courts. An improved permission procedure to protect the rights of citizens has gradually assumed greater importance, and increased opportunities for the participation by citizens and voluntary organisations are called for.

7.6 Compensation

Explicit provisions on liability and compensation for damage are embodied in the Water Act, Neighbourhood Act, Nuclear Liability Act and the legislation on the protection of marine environment, notably in the Act on the Prevention of the Pollution of Waters from Ships as well as the legislation on the prevention of oil pollution damage. Because this legislation does not specify the extent of liability and compensation for all cases, general principles governing liability and damage become applicable. Liability and the amount of compensation to be paid for pollution damage caused by ships are determined in accordance with international agreements binding to Finland.

A special feature is the compensation for damage caused by an activity which is subject to permission. The question of compensation is in water matters closely linked to the permission procedure: damage is allowed against the payment of compensation. Liability and compensation of this kind are of great practical importance in environmental protection. The amount of compensation rises with the level of damage.

The above mentioned legislation also contains specific provisions on objective liability and compensation. Where, for instance, marine pollution damage is caused through industrial discharges of pollutants other than oil that have escaped from a ship, provisions of the Water Act for strict liability become applicable. With respect to pollution of water by ships, the ship owners are responsible for any oil pollution damage, whether caused through fault or not.

In general, damage compensable under the above legislation includes concrete damage to objects as well as lost financial benefits, but excludes the so-called immaterial damage, while the Liability for Damage Act might, depending on the case, cover even immaterial damage. It would seem that the Oil Pollution Fund might compensate immaterial damage in so far as it is caused by oil pollution. However, damage must always be compensated where it entails the reduction of sales value of the property or prevents or hampers the use of the property.

Owing to the shortcomings of the regime of compensation the Ministry of the Environment administers an Oil Pollution Fund, financed separately from the national budget and designed to ensure prompt compensation to the victims of oil pollution damage (the Oil Pollution Fund Act of 1974, as amended in 1985). The fund is financed through contributions made

according to the quantity of oil imported or transported through in Finland. Contributions equal at present (1986) two marks per ton of oil. Allocations may also be made to the Fund from the national budget, as necessary.

Compensation from the Fund may be paid to persons or corporations that have sustained losses on account of an incident involving oil or to cover the expenses of persons who have participated in abatement of oil pollution damage. Similarly, compensation may be paid for damage resulting from any activities to abate oil pollution. The cost of purchasing anti-pollution equipment, maintaining operational readiness and training personnel may be reimbursed to municipalities, as well the cost of buying anti-pollution equipment to the State, redressing the environment following an incident and installing in ports reception facilities for oily wastes.

7.7 Development of legislation

7.7.1 General objectives

The increased importance of environmental protection and the greater appreciation of the significance of environmental policies have recently given an impetus to the reforms of environmental legislation in Finland. The application of recent legislation, such as the Waste Management Act and Air Pollution Control Act, is being monitored, the experience indicating that the revision of such legislation may be expected to become necessary. During 1987 the legislative work is planned to be completed by the promulgation of certain special acts, for example of a Noise Abatement Act. It is envisaged that reforms of essential legislation, including the overall reforms of the Water Act and the Planning and Building Act, will be undertaken in a near future. A number of relatively far-ranging partial reforms are under consideration; an example is the reform of the Nature Conservation Act. One of the major steps necessary for the introduction of penalties for environmental offenses will be the overall reform of the Criminal Code. Other major improvements will be the overall reforms currently underway of nuclear energy legislation and forestry legislation, which do not fall within the formal competence of the Ministry of the Environment.

The main emphasis in environmental legislation and legislative reform is likely to shift from the enactment of provisions on specific aspects of environmental protection to the structural examination of legislation. An overall survey of the legislative needs and the unification of legislation will be one of the focal points in future as well as the development of an environmental impact assessment procedure.

The Government has established an ad hoc committee to study ways for improving the permission and notification procedures and another one to inquire into environmental economy. Both of these important committees will prepare a report on the basic principles to be observed as well as make concrete recommendations for improvements. The work of the committees will be on a long-term basis and is not expected to lead to concrete legislative measures before about 1990.

administrative and judicial procedures for applying permission. The ad hoc committee for environmental economy will focus on the problems relating to the financing and of costs of environmental protection.

Legislation on the administration of environmental protection took the form of the Water and Environmental Administration Act of 1985 and the Municipal Environmental Administration Act of 1985. The implementation of the Acts is currently underway and no other extensive administrative reforms of substantial importance are envisaged.

7.7.2 Present status of reforms

The present status of reforms in various fields of environmental law is discussed below.

Under consideration on several occasions in the past, a partial reform of the **Nature Conservation Act** is currently being prepared, and plans exist also for its overall reform. The protection of landscape and shores present problems for the reform and will not lend themselves to easy solutions. As regards these issues, nature conservation legislation is closely related to planning and building legislation. It is an open question which legislation ought to address these issues. No extensive reforms of the **Air Pollution Control Act** and the **Waste Management Act** will be required in the next few years, but some minor amendments or completely new lower-category regulations may be necessitated by the implementation of air pollution control policies and the improvement of hazardous waste management.

When considering the reform of the Water Act, the Ministry of the Environment has reached the conclusion that the basic objective of the management of waters is the accommodation of the utilization of water resources for industrial and other purposes to the need of the protection of aquatic environment and nature conservation. With a view to the present stage of society, in carrying out the reform of the Water Act the best possible judicial and administrative procedures should be created to achieve the long-term objectives of water pollution control, management of the scenic values of waters and protection of ecosystems. The present Act incorporates these objectives. As regards the proposed revision of the appeal procedure, the Ministry of the Environment does not believe that the proposed amendments will ensure a prompt con-sideration of cases, or improve the rule of law, or take the consider-
ations of protection of aquatic environment adequately into account. Despite such shortcomings, the Water Act admittedly remains in many respects a viable environmental protection act. - The suggested ad hoc committee for permission and notification procedures mentioned above will most probably also examine the Water Act. The reorganisation of environmental protection administration, which is already underway, will also relate to water administration.

An act is under preparation for the pre-market and other **control of chemicals.** An important feature of the preparatory work is the division of responsibilities between the Ministry for Social Affairs and Health and the Ministry of Trade and Industry on one hand and the Ministry of the Environment on the other hand.

The **Soil Materials Act** of 1982 excludes any provisions on peat. Therefore, an act on the regulation of peat harvesting is under preparation at the Ministry of the Environment. While the act is aimed at controlling the harvesting of peat and making it subject to permission, its provisions will probably be less stringent than those contained in the Soil Materials Act on other soil elements.

With fundamental changes in society and building industry, the **Planning and Building Act** of 1958 no longer meets today's requirements. The regulation of planning and building involves basic social principles, land-use, the rights to use private property and other issues. Therefore no easy solutions are possible for this reform, which has been envisaged for more than fifteen years. General unanimity exists on the proposal to delegate powers to municipalities and on the needs for greater attention to environmental considerations, for increased public participation and for decreased bureaucracy. The powers of society for land-use planning in the countryside and the question of possible compensation schemes to be applied in cases of restrictions for the rights to use private property are the most problematic issues around the reform.

8 ENVIRONMENTAL ADMINISTRATION

8.1 Pre-1980s administration

8.1.1 General

Environmental affairs constitute a broad entity difficult to define in the Finnish administration. Environmental protection proper and functions closely associated with it include nature conservation and the management of conservation areas, promoting the recreational use of nature, water management and protection of the marine environment, combatting oil spills, air pollution control, noise abatement, promoting waste management and the utilization of wastes, preventing the environmental impacts of hazardous substances, soil protection, regulating the taking of soil materials and stone quarrying, conserving historical monuments, protecting the built-up environment and landscape management. Activities supporting environmental protection include environmental impact assessment, monitoring the state of the environment, the general planning, supervision and development of nature conservation, and environmental research.

Environmental affairs can in a broader sense also be said to include measures other than water management concerning the use and management of water resources, hunting and recreational fishing, the supervision of physical planning and building, housing affairs, the supervision and charting of radiation, surveying and geodetical research. Environmental hygiene may also be added to this list.

Until the 1980s there were major shortcomings in the handling of environmental affairs, in both the State and the municipal administrations. Environmental matters were dealt with by several ministries and the authorities subordinate to them, who were for the most part responsible for matters other than environmental ones. There was no clear policy on the handling of matters and little integration. The official resources of both central and intermediate-level as well as local government were also insufficient. Exceptions in this respect were the water administration and the public health administration responsible for environmental hygiene.

These administrative shortcomings naturally influenced the handling of affairs in many ways. This was particularly evident in the slow development of the legislation on environmental protection, which, inter alia, because of the decentralised administration came to lack overall uniformity, especially as regards the permit, notification and supervision systems. Work began on developing the administration, especially with reference to the State administration, in the early 1970s, when the environmental administration proper came into existence.

8.1.2. Main authorities

The main environmental administration authorities are shown in figure 22.

The first public authority responsible for environmental protection in Finland was the Government Counselor for Nature Conservation (cf. chapter 13.1).

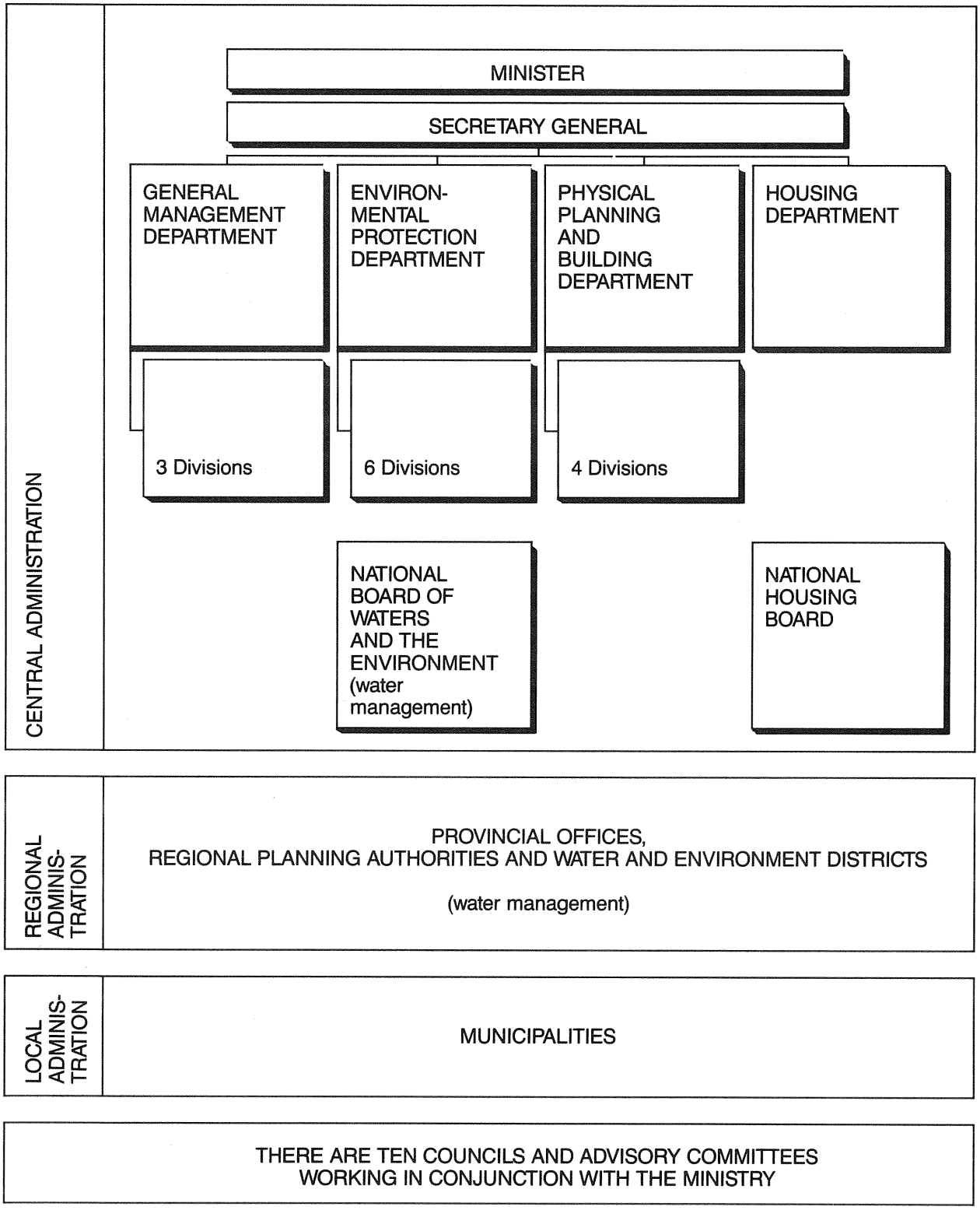

Figure 22. Environmental administration authorities.

An administration for water management and other water matters was established in 1970 in the form of the Water Administration subordinate to the Ministry of Agriculture and Forestry. This was to be a temporary solution, and Parliament demanded that the final location of the Water Administration later be investigated. The central authority within the Water Administration is the National Board of Waters, and subordinate to it are thirteen Water Districts. The Water Administration is specifically responsible for the overall planning of waters, water management, the use of waters for recreational purposes, water supply and sewerage, the prevention of floods, water research, and the protection of waters and their use. The Water Administration has also been entrusted with promoting the use of hydro power. The Water Administration has clearly been the strongest and most highly developed organization within the environmental administration. It employs a staff of about 1,500, over 400 at the National Board of Waters and about 1,100 in the Water Districts.

At around the same time steps began to be taken to develop the handling of environmental matters on a wider scale within the State central administration. On the initiative of an ad hoc Environmental Protection Committee established within the Council of State in 1970 an Environmental Protection Department was set up within the Ministry of the Interior and a Natural Resources Management Division at the Ministry of Agriculture and Forestry in 1973. An Environmental Protection Council was also set up within the Ministry of the Interior as an advisory organ. Its members represent the political parties, the relative power of these corresponding to their strength in the Parliament. The organizational reforms quoted here meant that environmental and nature protection tasks were divided among different ministries. The Natural Resources Management Division at the Ministry of Agriculture and Forestry was responsible for the protection of the countryside and the Water Administration subordinate to the Ministry for water management and other water matters. The Environmental Protection Department at the Ministry of the Interior in turn dealt with other environmental protection affairs. In 1977 a Natural Resources Council was also appointed at the Ministry of Agriculture and Forestry as an advisory organ. It constitutes of Political representatives in the similar way as the Environmental Protection Council. The new organizations suffered from a shortage of staff and funds throughout the 1970s. The Ministry of the Interior and the Ministry of Agriculture and Forestry together employed a staff of about 30 concerned with environmental affairs.

The administration has been further developed in the 1980s by setting up an Office for National Parks at the National Board of Forestry subordinate to the Ministry of Agriculture and Forestry to see to the management and planning of nature conservation areas on State land. In 1981 an Office of Environmental Affairs was founded at the National Board of Navigation subordinate to the Ministry of Trade and Industry to handle the prevention of oil pollution caused by shipping and other environmental matters connected with seafaring.

In the regional administration the principal environmental protection matters have with the exception of water management been handled since 1973 by the Provincial Offices. The Provincial Offices act as general administrative authorities subordinate to the Council of State and its ministries, from general administration point of view to the Ministry of the Interior. Environmental Protection Committees were set up as ad hoc

liaison organs at the Provincial Offices in 1976. The handling of environmental protection matters has at provincial level likewise been hampered since the beginning by a shortage of staff. Until 1982, when an Environmental Protection Section was set up at each Provincial Office, there was only one civil servant in the permanent staff in each province handling environmental protection affairs.

8.2 Establishing the Ministry of the Environment

The standardization of the handling of environmental matters and the development of the administration was investigated by the State central administration in various connections. In a memorandum issued as long ago as 1975 the ad hoc State Central Administration Committee proposed the establishment of a Ministry of the Environment of wide influence. Alternatively it was proposed that a separate National Board be established for the development of an environmental administration.

Defining the field to be covered by the Ministry of the Environment proved difficult. Since the Government failed to agree, a Government notification was placed before Parliament in spring 1982 on the founding of a Ministry of the Environment. This notification presented three alternative proposals for the new ministry's field. Two of the alternatives (put forward by the centre parties) were based on the view that the Ministry of the Environment should be responsible for environmental protection in its strict sense only. The third alternative (supported by the left-wing Cabinet parties) proposed an environmental ministry with much wider authority. According to this alternative the new ministry would, in addition to environmental protection and nature conservation, also be responsible for most water management tasks, fishing and hunting, radiation control, physical planning and building control, and housing policy. It was further demanded that a study be made of transferring cartography, surveying and geodetical research to the Ministry of the Environment.

The Government's notification stimulated broad debate in Parliament on environmental policy and Parliament requested the Government to reconsider the scope of the new ministry. The ad hoc Ministry of the Environment Committee accordingly appointed submitted its report in December 1982 and favoured a ministry wide in scope that would also take in physical planning, building control and housing policy.

Before this, however, in autumn 1982, Parliament had received proposals in connection with the annual budget for the legislation and funds required to set up a new ministry. Because of the Cabinet's party-political make-up the scope proposed for the new ministry was narrow. Parliament debated the founding of the new ministry in the course of the budget debate on the basis of the Bill and alternative proposals taken by Parliament.

The budget for 1983 set aside funds for the founding of a Ministry of the Environment, and in January 1983 the President of the Republic ratified the Act on the Number of Cabinet Ministries, the Act on Water Administration, and the amendment to the Act on Oil Pollution Fund. Under these acts the Ministry of the Environment was founded on

October 1, 1983. A decree was issued in June of the same year prescribing in detail the Ministry's organization and duties.

8.2.1 Scope and organization of the Ministry of the Environment

The establishment of the Ministry of the Environment meant integration of the environmental administration and concentration in the handling of the most important environmental tasks under a specific administration. The reform has increased the potential for intensifying and integrating planning, legislative work, research and supervision. The Ministry of the Environment also has more effective means of ensuring that the goals of environmental protection are enforced in other sectors of societal policy too.

The scope and tasks of the Ministry of the Environment were laid down mainly according to the broader administrative model proposed in the Government notification. Thus the bodies responsible for environmental protection at the Ministry of the Interior and the Ministry of Agriculture and Forestry were transferred to the Ministry of the Environment, which also took over water management and the prevention of oil pollution. This in turn involved the transfer of personnel from the National Board of Waters and the National Board of Navigation to the Ministry of the Environment. The supervisory powers of the Water Administration on water management were transferred from the Ministry of Agriculture and Forestry to the Ministry of the Environment on October 1, 1983. Physical planning, building control and housing policy were transferred from the Ministry of the Interior to the Ministry of the Environment. At the same time the National Board of Housing, which is the central-government authority on housing affairs, was made subordinate to the Ministry of the Environment.

Radiation control remained under the Ministry of Social Affairs and Health, fishing and hunting under the Ministry of Agriculture and Forestry. The Minister of the Environment did in the Cabinet appointed in 1983, however, also deal with radiation control.

The Ministry of the Environment has four departments: General Management, Environmental Protection and Nature Conservation, Physical Planning and Building, and Housing. Subject to the recent organizational rearrangements of the Ministry and in particular of the Environmental Protection and Nature Conservation Department, the title of the Department is planned to be shortened as of 1 March, 1988 as the Environmental Protection Department, 33 new posts were created at the founding stage, most of them in general management. At present the Ministry employs a total staff of about 250. Working in conjunction with the Ministry as advisory organs are three permanent councils and (constituted according to the principle referred to in chapter 8.1.2) numerous permanent committees in different fields. The organization of the Ministry of the Environment and the councils and committees operating in conjunction with it are shown in figures 23 and 24.

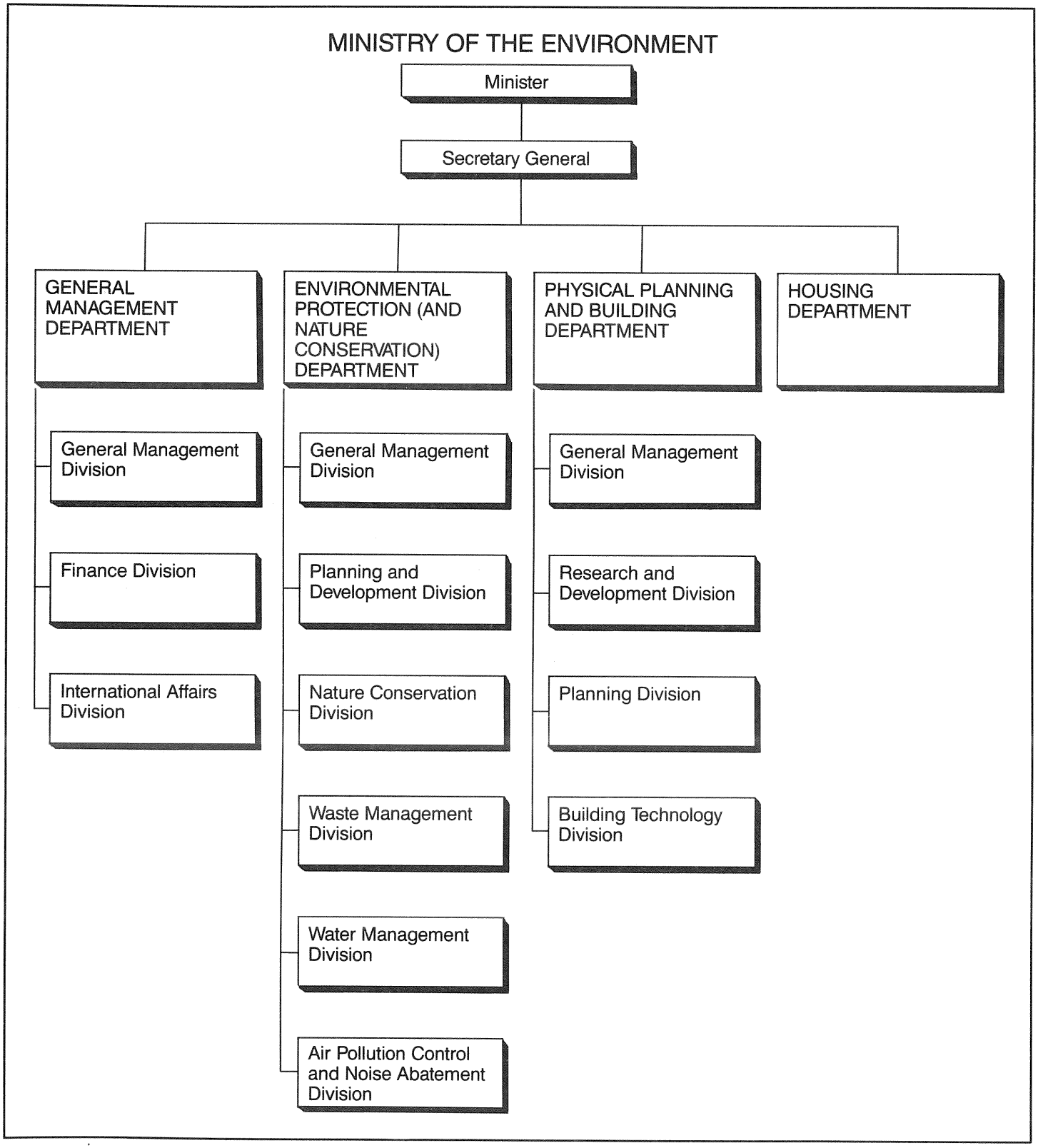

Figure 23. The organization of the Ministry of the Environment.

8.2.2 Ministry departments and their tasks

The General Management Department is divided into three divisions: General Management, Finance and International Affairs. This Department handles personnel administration, business administration, training, public relations and other matters connected with general management. It also handles the international affairs within the Ministry's scope not covered by the other departments. The Department at present has a staff of 42.

Protection of the environment by the Ministry is concentrated on the Environmental Protection and (Nature Conservation) Department. This department is divided into six Divisions: General Management, Planning and Development, Nature Conservation, Waste Management, Water Management, and Air Pollution Control and Noise Abatement. Advising and working with the Department are the Environmental Protection Council and other permanent advisory committees representing the various sectors, e.g. the Advisory Board for the Marine Environment, the Advisory Board for Waste Management, the Advisory Board for Air Pollution Control and the Advisory Board for Noise Abatement. The department has a staff of about 100.

The Environmental Protection (and Nature Conservation) Department at present handles (by virtue of the Decree on the Ministry of the Environment) matters concerning, among others, nature conservation and the associated landscape protection and management, the use of nature for recreational purposes, water management, protection of the marine environment, air pollution control, waste management and the promotion of waste utilization, the prevention of oil pollution, the prevention of the environmental impacts of toxic and other chemicals and hazardous substances, noise abatement, and the off-road traffic of motor-vehicles. The Department guides and supervises the administration and management of Finland's national nature conservation areas, these tasks, however, mainly being the responsibility of the Ministry of Agriculture and Forestry and its subordinate bodies, i.a. the National Board of Forestry and the Forest Research Institute.

The Department is further in charge of the general development and integration of environmental protection, monitoring the state of the environment, assessing environmental impacts, environmental economy and environmental research. International cooperation concerning environmental protection is for the most part handled by this Department.

The Physical Planning and Building Department has four divisions: General Management, Research and Development, Planning, and Building Technology. Attached to the Department are advisory committees: the Planning and Building Council, the Advisory Board for Planning and Building Research, the Advisory Board for Building Technology and the Soil Materials Committee. The total staff of the Department is at present around 90 persons. The duties of the Department consist of fundamental environmental protection tasks in planning the use of areas and supervising building.

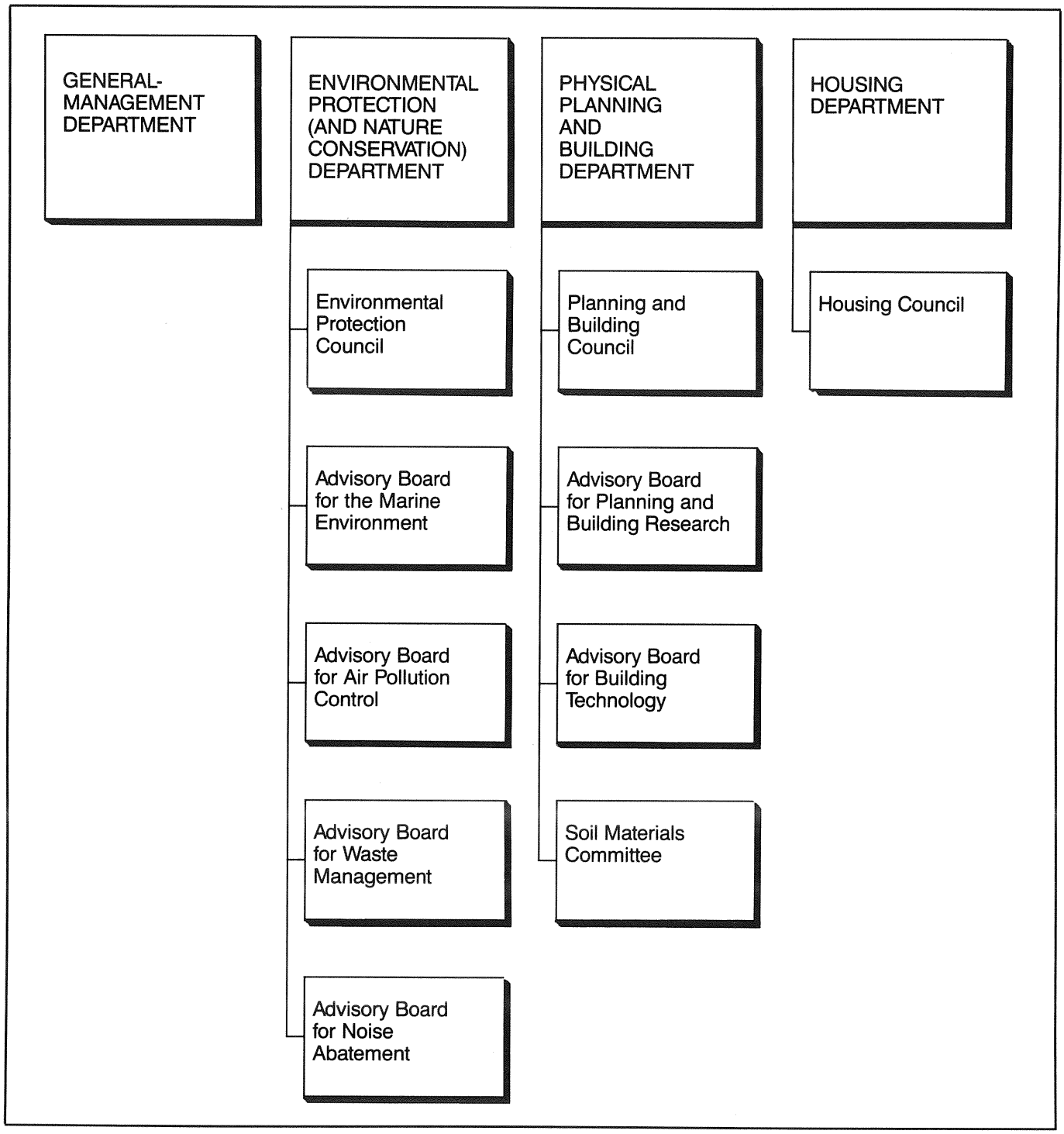

Figure 24. Permanent Councils and Advisory Boards operating in conjunction with the Ministry of the Environment.

It prepares plans for national land use, handles matters connected with the ratification of Regional and Master Plans and municipal Town Plans, prepares regulations and instructions on planning and building, guides and supervises the activities of the building authorities and grants building type approvals. Environmental protection tasks proper handled by the Department include regulation of the taking of soil materials and building supervision.

The Housing Department is one single division and has a staff of just over 10. Attached to it is the advisory Housing Council. The Department's main goals are the development of housing conditions in cooperation with the National Board of Housing subordinate to the Ministry. The National Board of Housing has a staff of about 200. Among its goals are making the volume, size, quality and amenity level of housing correspond to the population's needs. Attention is paid to ways of reducing inequality in the standard of housing, keeping housing costs reasonable and greater housing security. The Department also deals with matters connected with the quality and comfort of homes.

8.3 Reorganization of the water administration

The need for hydraulic engineering as one of the tasks of the water administration is decreasing and the emphasis in activities has shifted markedly to the management and protection of water resources and water supply. The promotion of the use of hydro power is in fact to be transferred from the water administration, mostly to the Ministry of Trade and Industry. The arrangements concerning the water administration are of fundamental significance to the development of the Environmental administration as a whole. The first reason for this is the central position and relatively strong organization of water administration in its own field. Major issues in the organization of the environmental administration have become the revision of the present tasks and organization of the water administration, the transfer of tasks from the water administration to the environmental administration and the relationship between the water administration and other environmental administration, especially the Ministry of the Environment and the Provincial Offices.

The reorganization of the water administration was interrupted on the establishment of the Ministry of the Environment. The organization of the tasks and status of the water administration was debated by the ad hoc Environmental Committee in 1982 and a separate ad hoc Water Administration Committee in 1983. The former Committee proposed that the National Board of Waters, its district organization and tasks be transferred from the Ministry of Agriculture and Forestry to the Ministry of the Environment, but so that the basic draining, subsurface draining and irrigation of agricultural land remain subject to supervision from the Ministry of Agriculture and Forestry. It was proposed that the promotion of the use of hydro power be taken away from the National Board of Waters. In 1983 the Water Administration Committee in turn proposed that the Water Administration be finally rearranged by discontinuing the National Board of Waters and transferring its tasks to a Water Division to be established at the Ministry of the Environment and to Water Districts and a Water Research Institute subordinate to the Ministry. The

Ministry of Agriculture and Forestry would, however, take over the Water Administration's former tasks concerning the irrigation of agricultural land.

As has already been stated, the top direction and supervision of water pollution control was on the establishment of the Ministry of the Environment transferred to this Ministry, Water Administration remaining under the jurisdiction of the Ministry of Agriculture and Forestry. The Ministry of the Environment conducted an extensive investigation in order to complete the Water Administration arrangements. Using this as a basis, the Government presented the necessary bills in conjunction with the 1986 budget in autumn 1985. These were passed by Parliament which, on January 17, 1986, endorsed the amendment to the Act on the Number of Cabinet Ministries and the Act on Water and Environmental Administration. The Acts come into force on October 1, 1986. The Ministry of the Environment has continued the preparatory work demanded by new the legislation in the course of 1986.

On October 1, 1986 the National Board of Waters changed into the National Board of Waters and the Environment, and in the general administration subordinate to the Ministry of the Environment. The Water Districts likewise became Water and Environmental Districts. The Ministry of Agriculture and Forestry has, however, continued to direct flood protection, land drainage, water supply, sewerage, and operations and maintenance linked to these in the Water and Environmental Administration. In addition to general administration the Ministry of the Environment has also become responsible for water management, the overall planning of the use, management and protection of waters, the recreational use of waters, water research and other matters connected with water administration that did not come under the Ministry of Agriculture and Forestry. The handling of water matters are thus spread over two ministries. This has called for close cooperation on the part of the ministries, especially in drawing up budgets and activity and economic plans as well as deciding on the use of Water and Environmental Administration's resources. The re-organization of the Water and Environmental Administration is shown in figure 25.

The position of each ministry in the Water and Environmental Administration vis-a-vis the National Board of Waters and the Environment is to be strengthened by transferring to the ministry tasks mainly concerned with the direction of planning and operations and decisions of political importance. The position of the Water and Environmental Administration as the expert authority is to be reinforced. Practical water measures have been and are still to be transferred on a broad scale away from the central administration to the Water and Environmental Districts. The National Board will concentrate on research, general direction and advice, training, the creation and maintenance of various data files and registers and monitoring the environment. The Water Research Institute attached to the Water and Environmental Administration is to expand into an institution for water and environmental research serving the Ministry of the Environment and the Ministry of Agriculture and Forestry by producing the research data required. In the same way the Water and Environmental Districts and research units will at regional administration level serve the Provincial Offices, among others, in their work.

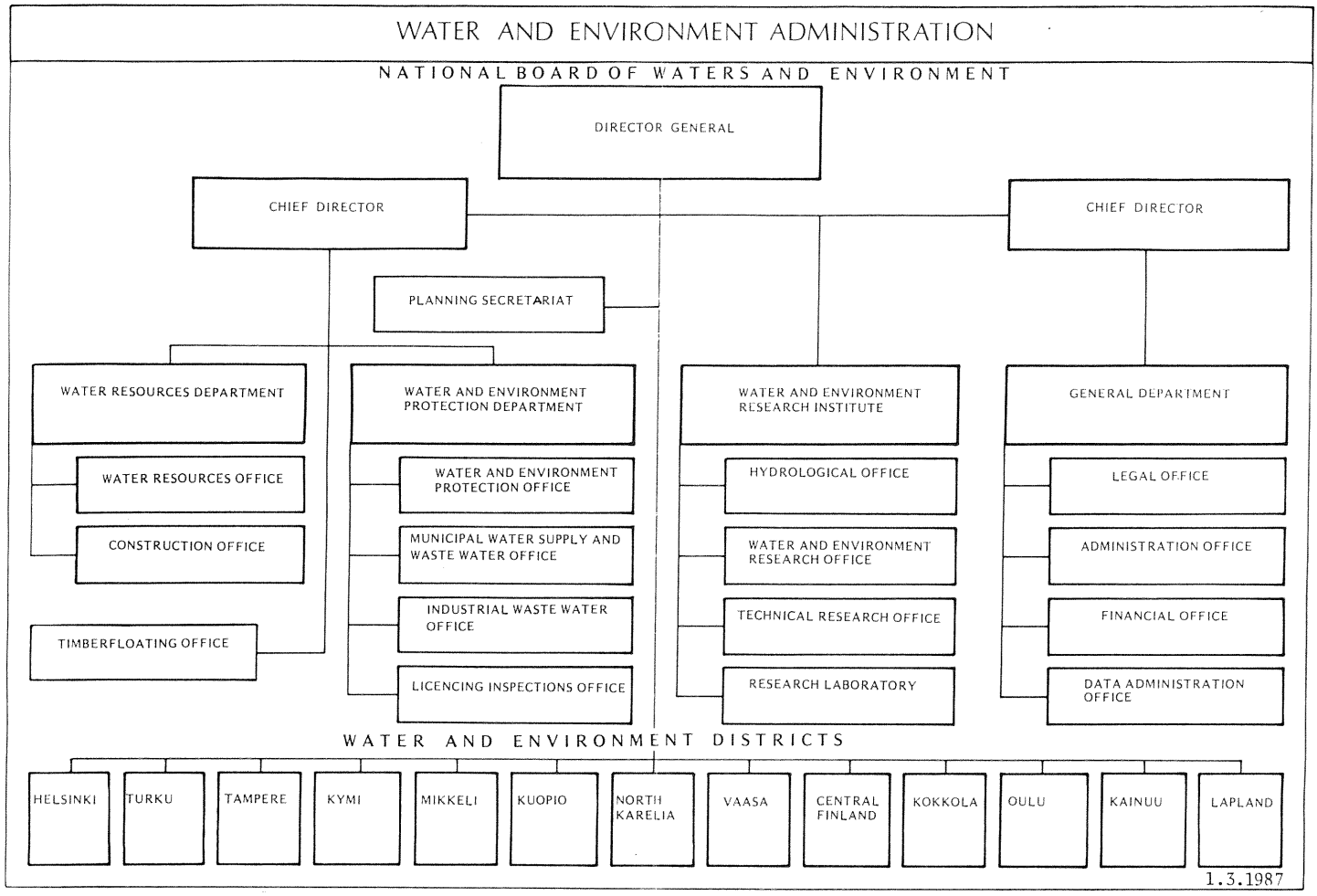

Figure 25. Organization of the water and environmental administration.

New tasks to be transferred to the water and environmental administration, monitoring the state of the environment, tasks connected with the maintenance and development of computer systems for data concerning environmental protection and more extensive environmental research than at present. Certain duties concerning waste management have been proposed to be given to the Water and Environmental Districts.

The decision-making, supervision and other official tasks concerning air pollution control and waste management for which the Provincial Offices and municipalities are responsible will not, at least at this stage, be transferred to the Water and Environmental Districts. The division of authority between the Water and Environmental Districts and the Provincial Offices on water and other environmental protection matters will continue to be considered.

The organization of the National Board of Waters and the Environment is to be revised by reorganising jobs, by cutting the number of units and, over a number of years, by transferring about 70 jobs to the Ministry of the Environment, the Ministry of Agriculture and Forestry and the Water and Environmental Districts.

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8.4 Main environmental protection tasks in other administrative fields

Even since the establishment of the Ministry of the Environment and the reorganization of the Water and Environmental Administration there are still a number of important environmental protection or closely associated tasks that are handled by other ministries or the national boards subordinate to them. There are at the moment no major plans for expanding the Ministry of the Environment further or transferring tasks to it from other sections of the administration. It has, however, until recently proved to be necessary to continue justifying the administration and management of some of such environmental affairs that have not clearly been subordinated to the sphere of the present environmental administration. Among such affairs have been e.g. the division of responsibilities between the Ministry of the Environment and the Ministry of the Education in the field of the recreational use of nature. It has also proved to be necessary to consider the delegation of some environmental affairs from the State central administration to the regional administration and in some cases even further to the local authorities. Towards these ends reports and preparations have been made in order to transfer some of the tasks related to the public financial support for nature conservation and environmental protection from the Ministry to the responsibility of the Provincial Offices or the Water and the Environmental Districts. According to the recent proposals related to the ongoing revision of the Outdoor Recreation Act, the handling and supervision of permits for the operation of camping sites should be transferred from the Provincial Offices further to the municipal Boards for Environmental Protection.

The administration, management and use of nature conservation areas established on State land is the responsibility of the National Board of Forestry (within the Ministry of Agriculture and Forestry) which for this purpose has an Office for National Parks. Certain nature conservation areas come under the administration and management of the Forest Research Institute subordinate to the Ministry of Agriculture and Forestry. The supreme direction and supervision of nature conservation areas is, however, in the hands of the Ministry of the Environment. The National Board of Survey (subordinate to the Ministry of Agriculture and Forestry) makes appraisals of the value of private land to be acquired by the State for nature conservation purposes as mandated by the Ministry of the Environment.

Hunting and sport fishing - which are closely connected with nature conservation and the recreational use of nature - are handled by the Fishing and Hunting Department of the Ministry of Agriculture and Forestry. The Game and Fisheries Research Institute under the same ministry conducts research in this field.

Official tasks connected with environmental hygiene are governed by the health legislation and come under the Ministry of Social Affairs and Health. In the central administration they are handled by the National Board of Health, Office of Environmental Hygiene. Environmental hygiene is closely tied to the tasks of the Ministry of the Environment, especially with reference to air pollution control, waste management and noise abatement. The revision of the permission procedure under the Public Health Act is at present under consideration and thus bears some

relation to the overall development of the permit and notification system of environmental protection.

Labour protection has much in common with environmental protection and is the responsibility of the National Board of Labour Protection and its districts subordinate to the Ministry of Social Affairs and Health.

Radiation protection connected with public health, medical use of ionizing radiation, labour protection and environmental hygiene is the responsibility of the National Board of Health subordinate to the Ministry of Social Affairs and Health. The supervision of the peaceful use of nuclear energy and the supervision of nuclear power plants comes under the jurisdiction of the Ministry of Trade and Industry. The Centre for Radiation and Nuclear Safety within the Ministry of Social Affairs and Health is responsible for practical radiation protection and supervision of the safety of nuclear power plants.

The administration of the control of chemicals is at present widely dispersed and in the hands of many different authorities. An investigation is being made in connection with the development of the legislation governing this field of the tasks and authority of the various authorities. At the moment supervising poisons and chemicals is the task of the Ministry of Social Affairs and Health, the National Board of Health and the Provincial Offices. The industrial use of toxic chemicals is supervised by the Ministry of Trade and Industry and the Technical Inspection Institute subordinate to it, which also supervise the use of explosive substances and inflammable liquids. The supervision of pesticides, fodder and fertilizers is in turn the responsibility of the Ministry of Agriculture and Forestry, the National Board of Agriculture subordinate to it and the State Institute of Agricultural Chemistry. The Ministry of the Environment handles the general prevention of pollution of the environment by chemicals. This does not, however, so far include executive measures.

Environmental problems caused by traffic that are not covered by environmental protection or the health and labour-protection legislation come under the Ministry of the Communications. For example, the regulations on the noise and exhaust gases emitted by motor vehicles have so far been issued under the legislation belonging to the Ministry of the Communications. Environmental protection issues arising in the planning of communications are dealt with in the context of land-use planning (see chapter 15). As sectoral questions they come under the National Board of Public Roads and Waterways subordinate to this Ministry and aircraft noise correspondingly under the National Board of Aviation. The Meteorological Institute within this same Ministry is the main establishment for air pollution research and serves as an expert body on air pollution control by virtue of the air pollution control legislation. The Institute creates models of how emissions spread, for example, and conducts other investigations of emissions.

The protection of buildings in planned areas and building ban areas under the Planning and Building Act comes under the jurisdiction of the Ministry of the Environment. Other matters concerning the protection of buildings under the relevant Act belong at central administration level to the Ministry of Education and the National Board of Antiquities subordinate to it. The responsibilities of the Ministry of Education in this respect have been proposed to be transferred to the Ministry of the

Environment. At regional level the Provincial Offices are responsible for the protection of buildings. The National Board of Antiquities in practice sees to the maintenance and upkeep of protected buildings belonging to the State. This Board and the Provincial Offices also handle matters coming under the Ancient Monuments Act.

Matters concerning environmental education are the responsibility of the Ministry of Education, with the National Board of General Education and the National Board of Vocational Education subordinate to it.

Environmental research is spread over several different ministries and technical universities. The biggest financiers of environmental research at the moment are the Academy of Finland, within the sphere of the Ministry of Education, and the Ministry of the Environment. At the Academy of Finland environmental research projects belong to the Environmental Science Committee. Most of the research financed by the Ministry of the Environment is concerned with waste management and the utilisation of wastes, air pollution control and water management.

The research and investigation into water management is chiefly carried out at the Water Research Institute and the Water and environmental Districts. The main establishments studying the marine environment are the Institute of Marine Research (Ministry of Trade and Industry), the Game and Fisheries Research Institute (Ministry of Agriculture and Forestry), and the universities. In the field of air pollution research the main establishments are the Meteorological Institute (Ministry of the Communications) and the Technical Research Centre (Ministry of Trade and Industry). Air pollution research is also carried out by establishments under the Air Pollution Control Act, i.e. the Forest Research Institute and the Agricultural Research Centre (Ministry of Agriculture and Forestry), and the National Public Health Institute (Ministry of Social Affairs and Health). Air pollution research is also conducted at many universities.

Waste research is at present concentrated at the State Technical Research Centre and the universities. Research into hazardous substances is at present rather scattered.

There is not enough research into nature conservation. No research establishment concentrates explicitly on this field. Nature conservation research is mostly carried out by universities.

Noise research is to some extent carried out at the Technical Research Centre of and the research establishments subordinate to the Ministry of Social Affairs and Health.

Environmental research administration is to be developed within the administration of the Ministry of the Environment by reinforcing the position and scope of the Water and Environmental Research Institute in particular. It is not, however, expedient to concentrate all research in this field on this research establishment. A permanent advisory committee enjoying wide backing is to be set up at the Ministry of the Environment in order to integrate and promote environmental research being carried out in different spheres.

8.5 Intermediate-level (regional) administration

The regional administration is made up of the Provincial Offices, which are the provincial authorities subordinate to the Cabinet and the ministries, and a number of government district administration authorities. Important environmental tasks are handled both by the Provincial Offices and by the Water and Environmental Districts. Certain envi-ronmental matters are also dealt with by the Roads and Waterway Districts subordinate to the National Board of Public Roads and Waterways, the Labour Protection Districts subordinate to the National Board of Labour Protection, the Provincial Surveying Offices subordinate to the National Board of Survey, the Regional Offices and Districts subordinate to the National Board of Forestry and the Fishing Districts. There are 11 Provincial Offices under the Ministry of the Interior in the general administration and their status and duties are defined in the Decree on Provincial Offices. The Provincial Offices have, inter alia, a General Department, a Department of Schools and a Department of Social Affairs and Health. The Provincial Office, which is headed by a Governor, is the highest administrative authority in the province and can impose conditional fines and other sanctions in order to execute its goals.

8.5.1 Environmental protection tasks of the Provincial Offices

The Provincial Office plays a central role in the supervision of the legislation on environmental protection and other enforcement of the law. With the exception of the water management belonging to the Water and Environmental Districts the majority of the main environmental protection tasks in the regional administration belong to the Provincial Offices. The environmental protection tasks of the Provincial Offices are handled by the Environmental Protection Divisions within the General Department. Some of these tasks also belong to the Planning and Housing Division within the same Department. The Department of Social Affairs and Health is responsible for environmental hygiene at regional level. Attached to the Provincial Offices as advisory liaison organs are the Provincial Environmental Protection Committees. In order to improve the handling of environmental affairs Environmental De-partments are being set up at the Provincial Offices. These will take in the Environmental Protection and Planning and Housing Divisions. So far an Environmental Department has been established at one Provincial Office (Uusimaa).

Among the environmental protection tasks of the Provincial Offices are the general supervision and direction of legislation enforcement. Under special Acts they make decisions on permits and notifications and issue statements to other authorities. The Provincial Offices' environmental protection tasks have greatly increased as a result of the development of the legislation. These tasks are comprehensive and demand wide and thorough expertise in the various sectors of environmental protection. The handling of tasks is particularly hampered by the shortage of personnel resources. Over the past couple of years more staff have been taken on for technical duties connected with waste management and air pollution control in particular, but even here the resources are not sufficient. Training on a wide scale is required in addition to new posts since activities are to be intensified.

The main statutory tasks of the provincial Offices (and their Environmental Protection Divisions) are defined in the Nature Conservation Act, the Waste Management Act and the Air Pollution Control Act.

As regards nature conservation the Provincial Office is particularly responsible for the implementation of various nature conservation programmes. The acquisition of areas for nature conservation purposes was made the responsibility of the Provincial Offices in 1984. The National Board of Forestry and the Provincial Surveying Office assist the Provincial Office in assessing the price of land to be purchased. The Provincial Office makes decisions on natural monuments to be protected and nature conservation areas to be established on private land. It also grants permissions to erect billboards outside built-up areas.

In waste management the main tasks of the Provincial Office, apart from general direction and supervision, are the ratification of Waste Management Plans by industry and business in cases where there is hazardous waste or a private waste disposal site involved. Other Plans are dealt with by the municipal authorities. The Provincial Offices also issue Hazardous Waste Processing Permits and superintend the enforcement of the Vehicle Junks Act.

The Provincial Office directs and supervises air pollution control in its province. It deals with the notifications made by industry and energy boards and makes the necessary decisions. It may if necessary stipulate conditions on decisions.

Under the Outdoor Recreation Act the Provincial Office deals with and ratifies municipalities' recreation trail plans and issues permits for the operation of camp sites. The Provincial Office also places restrictions on off-road vehicular traffic in order to protect the countryside. Similar restrictions may be imposed on motorboats.

In water management the tasks of the Provincial Offices have at least so far been limited to upholding the interests of general environmental protection at the Water Rights Court and in public inquiries. In noise abatement the tasks of the Provincial Office have also been slight, due to the undeveloped state of the legislation. Noise issues can be assessed at the Provincial Office chiefly in dealing with applications for shooting ranges. A Noise Abatement Act has, however, recently entered into force. According to the Act the direction and supervision of noise abatement at regional level will be entrusted to the Provincial Office.

Environmental protection and nature conservation are also dealt with by the Planning and Housing Divisions at the Provincial Offices. These present matters pertaining to the land-use plans drawn up by municipalities, exceptions to plans already confirmed and road plans. In connection with these the Divisions also deal with environmental protection issues, and a statement is usually obtained from the Environmental Protection Office.

The Planning and Housing Division also deals with the protection of buildings. Under the Soil Materials Act they further handle permits for large-scale taking of gravel and stone quarrying, for which a statement is always requested from the Environmental Protection Division.

The Departments of Social Affairs and Health at the Provincial Offices deal, among other things, with environmental hygiene, food inspection and the prevention of cruelty to animals.

The Provincial Administrative Courts operating in conjunction with the Provincial Offices handle as the first stage appeals on e.g. decisions made by local authorities on environmental protection. Appeals on decisions by the Provincial Administrative Court are made to the Supreme Administrative Court.

8.5.2 Water and Environmental Districts

The supervision of water management and other tasks under the Water Act in the regional administration is entrusted to the thirteen Water and Environmental Districts. Among their duties are the legal control prescribed by virtue of the Water Act, the planning of the use of water resources, surveys, promoting the recreational use of waters and tasks connected with hydrotechnics. Water management tasks belonging to the National Board of Waters and Environment and certain duties pertaining to the supervision of waste management are to be transferred to the Water and Environmental Districts.

8.6 Environmental administration in the municipalities

8.6.1 General

There is extensive local autonomy in Finland, and it holds a notable position in the public administration system. The local government handles a considerable proportion of the functions of society at local level. They also have the right to levy taxes. The general obligations and authority of the municipalities are laid down in the Local Government Act of 1976.

The obligations imposed on the local government must always be prescribed by law. One of the general goals for the development of the administration is to transfer obligations and power away from the State central administration and bring them closer to the population in the regional (intermediate-level) administration and municipalities. The administration can thus be made more democratic. The statutory obligations of the local government have in fact increased considerably. The direction and supervision of the State adminstration in the tasks handled by the local government has also increased even though efforts have in recent years been made to reduce this (e.g. the obligation to meet decisions by municipal authorities to a State authority). On the other hand the State supports the local government financially by State subsidies and grants.

Finland has at present 461 municipalities, 94 of them towns. A high proportion of them have a small population. This poses certain problems and has led to wide cooperation between municipalities, e.g. the formation of joint authorities of which there are two kinds: those which emerge on the municipalities' own initiative and those which are statutorily required. Of special significance to the environmental administration are the joint authorities for regional planning and those for public health. The Health Boards have carried wide responsibility for e.g. municipal air pollution control and environmental hygiene.

8.6.2 Municipal environmental protection

Environmental protection is handled by many different organs within the municipality: the Municipal Council and Municipal Board, the Health Board, the Board for Technical Affairs, the Building Board and the Water Board. A number of municipalities have over the past few years created voluntary Boards for Environmental Protection or the like.

Under the Public Health Act the Health Board has supervised environmental hygiene, such as control of waters for swimming and community air, the prevention of noise in the community, waste management and sewerage, health inspections at bathing beaches and camp sites, and the approval of factory and plant sites. The Health Board is also responsible for food inspection and seeing that the Poison Act is observed. On the coming into force of the Air Pollution Control Act the control of air pollution was transferred to the municipal air pollution control authority, whose duties have, however, in most municipalities been entrusted to the municipal or intermunicipal Health Board.

The main tasks of the Board for Technical Affairs in the field of environmental protection constitute waste water treatment, waste management and the maintenance of public areas. The duties of the municipal waste management authority are in most cases handled by the Board for Technical Affairs. Among other things the Board approves properties' Waste Management Plans, issues municipal waste management regulations and keeps a check on the environmental hazards of waste disposal sites and environmental litter.

The work of the Building Board also involves environmental protection in a number of ways. Through the building permit procedure the Building Board enforces the rules and regulations on air pollution control, noise abatement, water management, protection of the built-up environment, landscape management and waste management.

The Water Board acts as the permit-issuing authority on certain questions concerning the water supply, waste water and sewerage. It also supervises the enforcement of the decisions and regulations issued under the Water Act.

The permit authority laid down in the Soil Materials Act is the Municipal Board, whose decisions must in certain cases be submitted to the Provincial Office for ratification. The Building Board is responsible for supervision.

The Fire Board is responsible for the combatting of oil spills on land areas and certain chemical control tasks. It supervises the storage of inflammable liquids and explosive substances.

Environmental protection and nature conservation are also closely tied up with the work of the Physical Planning, Cultural and certain other boards.

By law the Helsinki Metropolitan Area Council handles the waste management of the municipalities involved according to special regulations.

It is further responsible for the monitoring, planning, training and information of air-pollution control in these municipalities. The official tasks of air pollution control belong to the air pollution control authority in each of the municipalities.

8.6.3 Legislation on municipal environmental protection administration

Under the Act on Municipal Environmental Protection Administration that came into force on October 1, 1986 the municipalities are obliged to supervise and promote environmental protection. By protecting, maintaining and developing the environment the municipality should ensure its inhabitants a healthy, attractive and stimulating living environment.

The general planning of environmental protection and its integration with other municipal functions are directed by the Municipal Board. To handle environmental protection tasks the municipality must create a Board for Environmental Protection. In a municipality with fewer than 3000 inhabitants the Municipal Council may decide to entrust the tasks of this Board to some other board, the Municipal Board or some division of these.

The tasks of the Board for Environmental Protection are prescribed by law. In addition to the general supervision and promotion of environmental protection it assumes the duties of the Water Board under the Water Act. The municipality thus no longer has a separate Water Board. It is also to assume the duties of the municipal air pollution control authority and waste management supervision. The practical arrangements for waste management are the responsibility of the Municipal Board or the board prescribed in the local regulations.

Transferring tasks under the Water Act, the Air Pollution Control Act and the Waste Management Act to the Board for Environmental Protection has called for amendments to these Acts. The Neighbourhood Act has also been amended to the effect that a statement must be sought from the Board for Environmental Protection on certain questions.

The Board for Environmental Protection may, under the local regulations, also be entrusted with other environmental protection tasks, such as the general promotion of nature conservation in the municipality.

There may be one or more officials in each municipality responsible for the handling of environmental protection affairs. Their posts may be full-time, subsidiary, or combined with some other post, a combination of various duties or shared by several municipalities. The professional environmental protection personnel must hold qualifications approved by the Ministry of the Environment. The municipalities will, it is estimated, be requiring about 500 new posts, to be established over the next five years.

The municipalities are entitled to State subsidy to cover the costs of environmental protection tasks under the legislation on the planning and State subsidy of social welfare and health care. This subsidy will be paid according to the municipality's financial capacity classification and will amount to 48 per cent on average. In 1986 State subsidies will be granted for 80 official posts.

According to the law the municipal officials must make allowance for environmental protection in their activities and cooperate as necessary.

The Board for Environmental Protection should be given an opportunity to make itself heard on issues in which environmental protection is of fundamental importance. It also has the right to obtain from the municipality and State officials any information it requires in the handling of its duties.

IV ECONOMY

9 ENVIRONMENTAL ECONOMICS

9.1 Cost of pollution and pollution control

The cost of pollution may be divided into costs caused by (1) pollution damages, (2) pollution control measures and restoration and (3) the prevention of pollution. In calculating the social costs of pollution, allowance must further be made for all the costs of pollution caused by production and consumption and also the economic benefits to be derived from improving the state of the environment (including financial and non-financial benefits influencing the welfare of society).

The expenditures of pollution control can be divided into the costs incurred by the State, by individual communities and households and by industry. The State and the municipalities also collect revenues from environmental protection, and in order to obtain the public net costs of pollution control, these revenues must be deducted from expenditures.

The data on pollution control expenditures are limited. With respect to institutional pollution control costs, the most abundant data available cover State expenditures and the cost of water pollution control to municipalities and industry. Statistics on water pollution control carried out by the municipalities have been collected by the National Board of Waters and Environment since 1970 in conjunction with an inquiry into water supply plants serving at least 200 inhabitants. Statistics on water pollution control measures conducted by industry have been collected by the National Board of Waters since 1972 in conjunction with an inquiry made at two-year intervals into industrial water consumption, waste water treatment and loads. In other pollution control sectors the cost data: 1) are based on individual investigations restricted to e.g. a specific occasion (such as when the costs of air pollution control are incurred by industry); 2) are entered under other expenditure items and cannot be separated (a major proportion of communities' environmental protection expenditure in the municipal statistics of the Central Office of Statistics); 3) have not been studied in detail; or 4) are in the process of being investigated (pollution control expenditures to industry and of the environmental protection costs incurred in individual households).

Limited statistics are available for the cost of damages, of damage prevention and of restoration measures. It is difficult to make a direct economic assessment of the ecological effects of pollution, and only a few rough estimates are available. However, the indirect economic effects of pollution (such as the effects of pollution on the value of land or property) have been studied in specific cases. Data on the costs of the prevention and treatment of pollution can be assembled from institutional costs and separate investigations. Examples of costs arising from preventive measures are those resulting from a reduction in emissions and the compensation that must be made and other costs of measures that must be taken as a consequence of pollution, e.g. from oil.

The social costs of pollution are difficult to assess, and this topic calls for investigations in the future. It is necessary to specify the cost items mentioned above and the prices of environmental commodities in order to obtain an accurate estimate of total social costs. However, some environmental commodities (such as air) are still regarded as 'free commodities', for which there is no fixed price and for which there is usually no charge.

9.1.1 Past trends

The public and industrial costs of pollution control are shown in Tables 19 - 22. Expenditure has risen in several years since 1970 to a good half per cent of the GNP. The environmental protection expenditure of Communities' has, it seems, been somewhat underestimated in previous assessments. According to an experimental investigation conducted by the Association of Finnish Cities (Table 20) expenditure on environmental protection in and by cities amounts to about 3% of budgeted expenditure. Assuming that the percentage of expenditure on environmental protection by municipalities other than cities is also about 3%, the annual sum of environmental protection expenditure by the State, communities and industry has usually been 0.7-0.8% of the GNP. Some rough estimates have also been presented of the magnitude of the expenditures of waste treatment incurred by industry. If these estimates are generally correct (about 500 million finnmarks a year), the total annual expenditure on environmental protection is more than 1% of the GNP. In the present decade government expenditure on environmental protection has annually ranged from 0.3 to 0.4 % of all expenditure in the national budget.

Table 19. Community waste water treatment plants, (million finnmarks, at 1982 prices).

Year	1970	71	72	73	74	75	76	77	78	79	80	81	82
Expenditure	103	80	132	230	333	313	186	152	172	154	145	154	131

Table 20. Environmental protection expenditure by cities in 1983 (estimate from budget items at fixed percentages).

Item		Million FIM	%	
104	Building inspection	15.0	25	
111	Fire fighting and rescue	35.0	10	
112,909	Oil pollution combatting	6.5	100	(1)
12	Agricultural Board	2.0	25	
124,125	Water Board, Forestry Board	0.5	50	
211	Public health inspection	36.5	50	(2)
461	Sport and recreation	117.5	25	
515	Land-use planning	31.0	25	
541	Traffic roads, sanitation	143.5	100	(3)
551	Parks and other public areas	106.0	50	
561,564	Solid waste management, removal and disposal of vehicles	88.5	100	
604	Agricultural and forestry estates	29.5	50	
705,707	Water purification	315.0	100	(4)
903	Public fixed assets	126.0	15	
Other	(Boards for Environmental Protection, aid for citizens associations, etc.)	4.5	100	
Total		1057.5		

(1) Operating and capital expenditure
(2) 50% or 1% of expenditure in main category
(3) 10% of maintenance unless specified
(4) 25% of water and sewerage expenditure unless specified

Source: Experimental investigation by the Association of Finnish Cities, 1983.

Table 21. Water pollution control investments in industry. 1961-1980 (million finnmarks, current prices)[1)]

Branch	1961 1970	1971	1972	1973	1974	1975	1976	1977	1978	1989	1980	1971 1980
1. In plant measures 2. Waste water treatment plants and sewers												
Forest industry												
1.	139.8	26.0	31.3	82.5	107.7	102.7	68.9	58.1	35.3	21.1	61.4	595.0
2.	45.6	16.8	41.3	28.1	39.6	63.9	29.9	78.9	41.9	22.5	35.1	398.0
Chemical industry												
1.	23.1	33.8	15.3	14.6	18.1	4.9	2.5	1.2	2.1	4.5	8.5	105.5
2.	15.6	8.4	18.0	16.2	3.0	45.9	1.4	0.8	2.3	22.7	8.8	127.5
Mining and metal industries												
1.	2.3	7.7	6.6	2.7	6.6	1.7	0.8	4.2	17.1	3.0	7.2	57.6
2.	13.5	3.4	4.3	2.1	1.4	9.0	13.0	4.4	5.3	4.8	4.9	52.6
Textile industry												
1.	0.6	0.4	0.4	1.9	1.5	0.5	0.8	1.3	0.6	1.1	2.9	11.4
2.	0.2	0.4	0.7	0.6	1.4	2.1	1.6	1.5	0.8	0.8	0.1	10.0
Leather industry												
1.	0.1	0.0	0.0	0.1	1.3	0.4	0.9	0.7	0.4	0.1	0.4	4.3
2.	0.3	0.0	0.3	0.2	0.5	0.7	0.2	0.8	1.4	1.3	1.8	7.2
Foodstuffs industry												
1.	14.8	1.7	10.2	3.7	2.0	11.0	11.2	13.4	18.3	12.9	5.9	90.3
2.	8.8	0.9	3.3	0.7	3.2	6.1	7.2	10.7	4.3	5.8	10.7	52.9
Power stations												
1.	-	-	-	-	-	-	-	-	0.1	4.6	3.6	8.3
2.	-	-	-	-	-	-	-	0.1	0.0	-	0.3	0.4
Industry, total												
1.	180.7	69.6	63.8	105.5	137.2	121.2	85.1	78.9	73.9	47.3	89.9	872.4
2.	84.0	29.9	67.9	47.9	49.1	127.7	53.3	97.2	56.0	57.9	61.7	648.6
Charges for joining public sewer systems (do not include charges for operation and maintenance)	0.3	0.0	0.1	0.6	0.5	3.2	4.2	13.5	2.1	0.1	0.7	25.3

1) Industry's water statistics of the National Board of Waters and Environment, Finland

Table 22. Expenditure by industry on air pollution control up to 1977 and 1978 (in million finnmarks, current prices).

Branch	Year	Million FIM
Electricity and heat production[1])	1977	c. 100
Wood-processing industry	1977	330
Iron and steel industry	1977	103
Manufacture of non ferrous metals[2])	1978	14
Foundries	1978	22
Building materials industry	1978	54
Basic inorganic chemical industry	1977	67
Chlor-alkali industry	1978	4
Oil refining[3])	1977	72
Basic organic chemical industry	1978	7
Total		773

Total operating costs c. 70 million finnmarks per annum (1978).

1) Includes 70 million finnmarks for particulate filters and c. 30 million finnmarks in additional costs for stacks higher than 80 m.
2) Does not include particulate collection in flash smelting and other such processes.
3) Includes only desulphuration from refinery fumes, not anti-evaporation measures, stacks, etc.

9.1.2 Future trends

The future trend in environmental protection expenditures will be influenced by the goals of pollution control laid down by society, and by economic development trends and related factors. The formulation of the goals of environmental protection will be integrated with the goals of economic and other social policy wherever possible. Measures and programmes of objectives are at present being prepared in the various sectors of pollution control, in conjunction with which the costs and benefits of the measures demanded by these goals are also being investigated. The most important of these are:

- planning the reduction of sulphur emissions;
- planning the goals of water protection;
- preparing a programme for waste re-use and recycling;
- planning the reduction of air pollution caused by motor vehicles;

- enforcing noise abatement;
- developing nature conservation measures.

The costs will as far as possible be covered in accordance with the Polluter Pays Principle, but in the case of nature conservation measures, for example, the government will extent have to bear most of the burden of the costs. The preparations for the above measures do not specify how the costs will be covered, but they do to some extent specify the magnitude of the costs. The following describes some of the cost estimates for future measures.

An ad hoc Sulphur Commission has prepared the program for the measures proposed by the Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes. The Commission presented detailed suggestions for a 30% sulphur emission reduction by 1993 based on the 1980 level. It also presented justification for a further reduction to at least 50% in the 1990s. In the course of its work the Commission also specified the preconditions for a 50% reduction as early as 1993.

A 30% reduction by 1993 could be achieved by limiting the sulphur contents of coal to one per cent, and the sulphur contents of oil distillates to 2.7%. The annual cost for these operations would amount to at most 60 million finnmarks. Alternatively, the purification of smoke gases from new coal-based power plants and a lowering of the sulphur contents of oil distillates would cost some 100 million finnmarks annually.

A 50% reduction of emissions i s possible by 1993, and the Commission suggested measures to be taken to achieve such a goal, including a reduction of the sulphur contents of coal, light fuel oil and heavy fuel oil, desulphurization at the major existing coal power plants and from the smoke gases of medium-size and big coal power plants to be built, also measures affecting pulp production, oil refining, activities, and production of sulphuric acid. By timing these measures, the year of reduced emissions may be calculated advance. These proposals would cause, by the end of 1993, investments of between 1,550 and 1,800 million finnmarks, of which investments in other fields than the production of electricity and heating would correspond to some 650 million finnmarks. In the year 2000 the total annual costs would amount to 600-800 million finnmarks. The price of electricity would increase by some 3% due to these costs (0.4-0.6 p/kWh).

In early 1987, the Advisory Committee for Water Management, which had been nominated by the Council of State, presented a Water Conservation Programme with recommendations for the years up to 1995. According to the Committee, the need for water conservation should henceforth be defined on an in casu basis so that protective measures could be taken in the right places and so that the costbenefit relation would be the best conceivable. The National Board for Waters and the Environment has worked out detailed alternatives for reducing the effluent load in certain important areas of water conservation, but the delegation has not discussed these. Here, a few of the alternative goals for water conservation on an in casu basis are presented, with cost estimates,

with regard to the pulp and paper industry ant to community effluents.

The were three alternatives for goals and measures affecting the pulp and paper industry, and one in casu alternative. The invesment costs for one combined alternative, which was considered workable, amounted to some 2.5 milliard finnmarks, the increase in annual running costs amounting to some 145 million finnmarks (1984 price level). In the opinion of the National Board for Waters and the Environment this would lead to a lessening of the poison load of effluents, and also to a lessening of the Bod_7 load to a level of 160 tons a day. Investement needs for water protection in other branches of industry for the years 1986-1995 was estimated at some 55-100 million finnmarks annually by the National Board of Waters and the Environment (1984 price level).

According to an estimate worked out by the National Board of Waters and the Environment, a more efficient protection affecting communal effluents, based on special requirements for each water course on an in casu basis, would cost some 400 million finnmarks in annual investments during the 1986-1995 perios and some 35-million finnmarks in annual running costs (1984 price level). After the measures envisaged in the estimate have been taken the remaining communal effluent load would amount to some 12,500 tons of Bod_7 and 450 tons of phosphorus annually. Moreover, in order to reduce non-point source pollution, investments of between 0.5 and 1.5 milliard finnmarks are necessary.

9.2 Trends in pollution control measures and costs

Trends in pollution control measures and costs have been influenced by national pollution control policy and, in particular, by fluctuations in economic development and government policy aimed at stabilizing economic development. The trends have been further influenced by structural changes in production and the accompanying technological progress. No special investigations have been made in Finland into factors influencing the trends in environmental protection measures which are, furthermore, difficult to define and to distinguish. The factors have, however, been touched on in certain studies. The following conclusions are based on these studies and on other statistical studies on economic development, including the explanations of State budgets and economic surveys.

9.2.1 Effect of fluctuations in economic trends

Like many other states, Finland tried to intensify her pollution control policy in the early 1970s in particular, at a time when economic trends also favoured a policy of reform. One of the items in the 1973 budget was the establishment of a separate ministry for environmental affairs; as the first step a Department of Environmental Protection was set up at the Ministry of the Interior. Even at that time a long-term goal of objectives was laid down for water pollution control, including an investment and financing programme.

The energy crisis of 1973 and the ensuing economic recession in the middle of the decade were widely reflected in the environmental protection measures undertaken by the government, communities and

industry. Compromises had to be made over goals. The recession at the end of the 1970s had similar, though less pronounced, impacts. Although no detailed examination has been made of the extent of reductions in environmental protection measures, the matter has been touched on in certain investigations.

The impact of an economic recession is evident from the trend in the costs and investments in pollution control by communities and industry (see Tables 19, 20 and 21). The drop in investments is consistent with the conclusions drawn about the trend in environmental protection investments in the investigation into the economic effects of environmental protection. Although corresponding cost statistics are not available for the other sectors of environmental protection, the trend seems to be similar. From the statistics, the effects of the recession of the late-1970s seem to be slighter than those of the mid-decade recession.

In order to eliminate the effects of the recession and, especially, to stabilize investments, efforts were made in the second half of the 1970s to develop the government's anti-cyclical policy measures as part of the economic recovery policy (e.g. export levy systems). These also included measures promoting pollution control. Even before this, industry had been able to finance water pollution control investments with loans out of funds accruing as depreciations of export levies.

Investments promoting pollution control were given as one item for which export levy funds deposited in the anti-cyclical fund under the Export Levy Act could be used. Investment reserves under the Investment Reserve Act could also be used to cover expenditure incurred in pollution control. In 1977-82, attempts were also made to boost investments by lowering the turnover tax on machinery, equipment and buildings. This did not, however, apply to pollution control investments as such, but only to investments aimed at raising the productivity level. In addition, special financing assistance for pollution control has been used to counteract economic fluctuations (see 9.4.1). As a result of anti-cyclical policy, the interest credit on interest subsidy loans has been temporarily raised by 0.25-2 percentage units, most recently in 1982.

According to the ad hoc Working Group investigating the effectiveness and efficiency of economic instruments for pollution control by industry (see 9.4.1), the government's anti-cyclical policy measures have had little effect in promoting pollution control measures. The working group likewise assessed the effect of changes in interest subsidy for pollution control being negligible as a means of anti-cyclical policy. The reduction in pollution control investments by industry can also be seen during recessions as a decrease in the demand of public financial assistance for pollution control investments.

Several attempts have been made to improve international competitiveness by devaluating the Finnish mark (in 1977 and 1978, for example). However, without more detailed study it is difficult to prove the effect of devaluation or its connection with environmental protection.

9.2.2 Effects of structural changes and technological change

The trend in environmental protection measures has been influenced not only by government environmental policy measures, economic fluctuations and anti-cyclical policy but also by major changes in the structure of the Finnish economy. The proportion of sectors experiencing a rapid increase in productivity has dropped and the proportion of sectors experiencing a slow increase in productivity (especially services) has risen.

The Finnish wood-processing industry in particular underwent an appreciable structural change in the latter half of the 1970s with the introduction of increasingly integrated production methods; at the same time it made efficient use of the latest technological achievements. The production of sulphite pulp has decreased with the closing down of a number of mills, but the demand for bleached sulphate pulp and paper has increased. It seems highly likely that the advantages resulting from the scale economies of production as part of the structural change have helped to reduce the load on the environment in various sectors. However, a separate investigation is needed to prove this.

9.3 Application and development of the "Polluter Pays Principle"

One fundamental principle behind the financing of environmental protection, and one that is also at the bared of legislation on environmental protection, is the Polluter Pays Principle. According to this the industry or community causing environmental pollution pays the costs of preventing future pollution, of restoring the environment and of compensation for any damage. This principle was recorded in the Government Report on Environmental Protection submitted to Parliament on August 28, 1984. In developing and applying environmental policy measures, Finland observes the recommendations of the OECD on the application of the Polluter Pays Principle.

Only few investigations have been made of the implementation of the Polluter Pays Principle, though the subject has been mentioned in certain studies. The implementation of the Principle is manifested in the type of expenditure the government and communities incur through pollution control measures, the ways in which these costs are covered and the size of the fees charged. It is, however, difficult to make any comprehensive study of this in the absence of adequate cost statistics and especially in view of the problems of measuring all the social costs of pollution. The economic support granted by society (to industry in particular), on which the OECD has issued detailed recommendations, will be discussed later (9.4.1).

According to the OECD's definition of the Polluter Pays Principle, whether or not the polluter is obliged to pay the victim compensation for damage caused is immaterial. According to the OECD, the obligation to compensate does not conflict with the Polluter Pays Principle. In Finnish legislation, e.g. the Water Act, there is, however, a clause on compensation (including compensation obligations). There are also differences between OECD member countries in the extent to which polluters are charged the costs of environmental administration.

In Finland administrative costs are charged in part (e.g. an applicant applying to the Water Rights Court for a permit pays the necessary costs and investigations). Administrative costs may also be charged under the Accrual Basis Act. Its application to environmental protection measures and especially its relationship to the Polluter Pays Principle does, however, need to be investigated further.

Municipal environmental protection measures are financed by fees (such as waste water and solid waste management charges) out of municipal tax funds and by government subsidies. The application of the Polluter Pays Principle has not been studied in this context. According to the Council of State's report the Principle should be observed more closely than at present in covering the costs to communities of waste water and solid waste management. In fact, the existing legislation requires such coverage.

The environmental administration is at present conducting several investigations into the application of the Polluter Pays Principle. Examples are the work of the Sulphur Commission and the Advisory Committee for Water Management and the preparation of a Noise Abatement Act. The extent to which the Principle is applied, the definition of a polluter, the nature of and need for public subsidy and other such general aspects of the application of the Principle are to be investigated by the ad hoc Committee on Environmental Economics. This committee was appointed in June 1986 to look into the financial assistance and other economic instruments for industrial pollution control measures.

9.4 Economic instruments and compensation systems

9.4.1 Economic instruments for industry

The economic instruments of industrial pollution control have consisted mainly of various kinds of financial assistance. Industrial pollution control is also promoted by certain other economic instruments, such as taxation and charges.

Financial assistance to industry is granted in the budget by the Ministry of the Environment and the Ministry of Trade and Industry. The assistance granted by the Ministry of the Environment consists of interest subsidies, export levy loans (until the end of 1985) and State guarantees and is aimed at facilitating the financing of pollution control measures to be taken by industry. The financial assistance granted by the Ministry of Trade and Industry (The Technology Development Centre, TEKES) is chiefly for the research and development of clean technologies.

Certain other institutions also give financial assistance for pollution control by industry. The Mortgage Bank of Finland Ltd. (owned by the Postipankki) grants loans while the Finnish National Fund for Research and Development (SITRA) and the Regional Development Fund of Finland Ltd. (KERA) give financial support for R&D. Detailed information on the various kinds of financial assistance is given in tables 23 to 29.

Table 23. National programme in 1974-1983 for financing water pollution control in industry (million finnmarks, current prices).

Year	Export levy loans[1]	Interest subsidy loans[2]	Interest subsidy paid	Posti-pankki commer-cial loans	Mortgage Bank of Finland Ltd. loans	Loans granted total	W.p.c. investments in industry (total)
1974	11.0	30.0	-	1.8	53.9	96.7	186
1975	12.0	51.4	0.227	6.8	70.4	140.6	249
1976	-	48.7	1.314	3.6	52.0	104.2	138
1977	3.4	11.1	2.226	3.7	19.2	37.4	176
1978	20.4	1.5	2.537	-	11.3	33.2	130
1979	13.1	2.3	2.547	-	12.8	28.2	105
1980	20.0	23.8	2.489	-	56.8	100.5	152
1981	11.0	37.1	2.263	-	30.5	78.6	150
1982	10.9	78.1	1.390	-	92.3	181.3	313
1983	14.8	17.7	1.961	-	18.8	51.3	..

1) Loans granted by the Government from the State Budget. Funds provided from export - levy collected from industry in the late 1950's. Loans not available after the year 1985.

2) In 1974-1977, funds available for these loans from the Government owned Postipankki (post Office Bank). From 1978 onwards no special funds but commercial loans receiving interest subsidy.

Table 24. Trend in interest subsidies on water pollution control investments made by industry (million finnmarks, current prices).

Year	Investments in receipt of loans	Loan authority	Loans applied for	Loans granted[1]	Interest subsidy granted	Interest subsidy paid
1974		30.0		30.0	0.2	
1975		60.0		51.4	0.3	
1976		50.0		48.7	2.0	1.3
1977		40.0		11.1	3.3	2.2
1978	7.0	30.0	6.6	1.5	4.1	2.5
1979	10.7	50.0	3.4	2.3	4.1	2.5
1980	61.7	40.0	0.6	23.8	4.1	2.5
1981	130.8	40.0	37.2	37.1	4.1	2.3
1982	232.0	110.0	78.4	78.1	3.1	1.4
1983	20.1	40.0	6.9	17.7	3.5	2.0
1984	84.3	40.0	26.6	26.6	4.0	2.8
1985	49.2	40.0	11.4	18.0	6.0	4.5
1986	54.6	55.0	25.1	20.3	8.1	5.0
1987[2]	112.2	30.0	64.3	30.0	9.6	4.5

1) In many cases export levy loan was applied for, but only interest subsidy loan was granted. See also footnote 2) in Table 23.
2) preliminary data

Table 25. Trend in interest subsidy on air pollution control investments made by industry (million finnmarks, current prices).

Year	Investments in receipt of loans	Loan authority	Loans applied for	Loans granted[1]	Interest subsidy granted	Interest subsidy paid
1979	2.3	15.0		0.6	0.1	
1980	11.4	30.0		5.7	0.5	
1981	17.3	30.0		10.9	0.9	0.050
1982	35.0	50.0		19.1	1.8	0.130
1983	58.0	60.0		40.7	1.0	0.477
1984	28.2	60.0	22.0	17.2	1.6	0.885
1985	121.0	80.0	120.6	79.5	3.0	2.095
1986	44.7	90.0	36.3	29.2	5.0	1.873
1987[2]		70.0	68.2	68.1	6.0	2.612

1) Commercial loans receiving interest subsidy
2) preliminary data

Table 26. Water and air pollution control loans granted by Mortgage Bank of Finland Ltd. (million finnmarks, current prices).

Year	Water pollution control		Air pollution control	
	Loans granted[1)]	Investments in receipt of loans	Loans granted	Investments in receipt of loans
1974	53.9	125.6		
1975	70.4	182.6		
1976	52.0	135.3		
1977	19.2	48.6		
1978	3.3	8.6		
1979	8.0	24.2		
1980	98.5	206.6	11.4	19.2
1981	77.7	170.7	14.4	24.0
1982	42.1	84.8	26.5	47.2
1983	143.3	432.8	27.7	46.1
1984	92.7	206.1	89.5	410.6
1985	70.8	141.4	29.0	50.7
1986	105.8	212.4	42.5	90.6
1987	152.7	386.4	30.5	75.3

1) Figures include loans granted in accordance with the overall financing system (Table 23).

Table 27. Export levy loans for water protection by industry[1)].

Year	Loans granted at current prices (Million FIM)	Rate of interest
1974	11.0	6
1975	12.0	6
1976	-	-
1977	3.4	6
1978	20.4	5
1979	13.1	5
1980	20.0	6
1981	11.0	6
1982	10.9	6
1983	14.8	6
1984	13.0	6
1985	11.0	6
1986	-	-

1) See footnote 1) in Table 23.

Table 28. Amount of water and air pollution control loans receiving State guarantees (million finnmarks, current prices).

Year	Loans	
	Water pollution control	Air pollution control
1975	18.2	-
1976	12.3	-
1977	8.7	-
1978	5.8	-
1979	6.4	-
1980	-	-
1981	35.4	-
1982	33.4	-
1983	88.2	-
1984	36.6	13.4
1985	39.4	7.3
1986	21.8	1.9
1987	11.8	-

Table 29. Total amount of investment reserves withdrawn and their use for environmental protection in 1980-1986.

Year	Reserves withdrawn, total, Million FIM	Reserves spent on environmental protection, Million FIM
1980	11.8	-
1981	56.1	0.824
1982	1044.8	3.328
1983	1162.6	-
1984	348.9	-
1985	136.5	-
1986	1135.9	0.118
1987	2331.0	-

The aim of measures related to taxation (such as the right to accelerated depreciation, turnover tax relief) is to facilitate the implementation of centralized pollution measures.

Certain other economic instruments are also used, such as municipal waste water and waste management fees, water protection fees, oil combatting charges, Waste oil charge, a special tax on beer and soft

drinks in non-returnable containers and deposits on returnable bottles. Investment fund reservations (with the Bank of Finland) were developed as part of stabilization policy but they have been of minor importance from the environmental point of view.

An ad hoc Working Group at the Ministry of the Environment has assessed the effectiveness and efficiency of economic instruments and looked into potential ways of improving the present system. The Group stated that the financial assistance granted to industry is compatible with the Polluter Pays Principle.

The Working Group estimated that the economic instruments have not been sufficiently effective. Although financial assistance has facilitated environmental action by industry, and certain charges and taxes have had some impact, the present economic instruments are insignificant with regard to the demands made on them. This is because of the absence of principles for economic instruments used in environmental protection, which has itself led to an unsystematic approach. More efficient economic control calls for the development of economic instruments based on, but more uniform, versatile and efficient than the present system.

The Working Group made a closer study of the potential for developing the financial aid for pollution control by industry, for developing taxation, for improving the quality of the environment and extending the use of charges in pollution control. A brief survey has been made of new economic instruments in the United States based on business transactions between enterprises (bubbles, offsets) and marketable permits. A brief survey of insurance systems related to pollution control was also made.

The Working Group proposed that an ad hoc committee be appointed to study the development of economic instruments for pollution control by industry. The ad hoc committee on environmental economics was appointed in June 1986. The main tasks will be to survey the financing of pollution control measures based on the Polluter Pays Principle, to study the economic instruments best suited to achieving the environmental objectives laid down by society, and to make proposals for the comprehensive development of economic instruments in the various fields of pollution control.

The Working Group also proposed that a system for updating statistics be created as a basis for developing economic instruments and for use in all environmental decision-making. It would then be necessary to implement a survey of industry's investments in pollution control and the costs involved. A study should also be made of the potential for combining industry's system for monitoring the costs of air pollution control and waste management with the present water statistics kept by the National Board of Waters and Environment. This work is carried out in connection of the work of ad hoc committee on environmental economics.

9.4.2 Economic support for communities

Municipal pollution control measures are financed mainly by municipal revenues, municipal water and solid waste management and financial aid

from the government. The effects of economic support from society and the need to develop this support have so far not been examined in any great detail. An ad hoc Committee, appointed in 1981 to look into the organization of municipal administration for environmental protection estimated that an average of six marks per inhabitant contribute to annual municipal pollution control expenditure, i.e. a total of about 30 million finnmarks a year. It was subsequently estimated that, if State subsidies amount to an average of 50% of the total, the maximum annual cost to the state of municipal administration is 15 million finnmarks.

The Committee did not, however, examine the significance of existing State subsidies and the need to develop these as a means of promoting municipal environmental administration. The following subsidies were designed especially for communities or may be used by them:

- State aid for municipal pollution control;
- State aid for municipal air pollution control;
- State aid for municipal environmental health supervision;
- interest subsidy on investments in the establishment and maintenance of public waste treatment facilities;
- interest subsidy on investments promoting waste recovery;
- interest subsidy on investments in municipal water pollution control;
- aid for nature conservation and recreation studies;
- other aid for nature conservation measures (compensation, grants);
- aid for environmental management in the offshore islands;
- aid for municipal water protection measures;
- aid for measures to combat oil pollution.

First, a study should be made of the efficiency of subsiding municipal pollution control administration and the need to develop various forms of support. The ways of covering the costs of municipal environmental protection (fees, taxes, public aid) and the implementation of the Polluter Pays Principle should be given special attention in such a study. The studies should be based on an investigation into the costs of municipal pollution control.

9.4.3 Economic guidance for households

Household pollution control measures are also encouraged by economic instruments such as municipal waste water and solid waste management fees and deposits on returnable glass bottles. A special tax on beer and soft drinks in non-returnable containers was levied at the end of 1970s.

This has encouraged the use of returnable bottles and made significant contribution to the prevention of litter.

Economic guidance for consumers has been investigated at the Helsinki School of Economics. E.g., the conflict between consumers' environmental attitudes and behaviour and the factors influencing this conflict, such as economic, institutional and 'free-rider' factors has been studied. This research helps to develop economic guidance concerning environmental protection for consumers.

9.4.4 Compensation and insurance systems

The reduction and elimination of pollution and the determination of compensation are to some extent covered by statutory permit and notification procedures. Economic instruments are generally intended to promote the implementation of preventive measures. In this respect economic instruments thus support administrative guidance. Of the existing economic instruments, the oil pollution combatting charge and oil pollution combatting fund system are by their nature repressive, since their main purpose is to guarantee compensation for damage that has already occurred. The holder of a licence to load the water system may be obliged under the Water Act to pay the State a water protection fee.

Oil pollution combatting charge. Since 1975 a special charge has been collected from the importers of crude oil and oil products by way of contribution to an Oil Pollution Fund to finance the abatement of oil pollution damage to the sea, lake and land areas. Compensation from the Fund may be paid to persons or corporations that have sustained losses as the result of an incident involving oil pollution or to cover the expenses of persons who have helped to tackle pollution damage. Similarly, compensation may be paid for damage incurred as a result of attempts to tackle pollution. The cost of purchasing anti-pollution equipment, maintaining operational readiness and training personnel may also be reimbursed to municipalities. The cost to the State of buying antipollution equipment, the treatment of the environment following incidents and the installation of reception facilities for oily wastes in ports may be compensated for, too.

The oil pollution combatting charge is two marks per ton of crude oil or oil products imported to or transported through Finland. Contributions may also be made to the Fund from the national budget, if necessary. In 1985 15.8 million finnmarks was received as oil pollution combatting charges and 15.2 million was paid out in compensations. The surplus from 1985 was about 503,000 finnmarks.

The Oil Pollution Fund is managed by the Ministry of the Environment. An Oil Pollution Board assists the Ministry in matters regarding the compensations to be paid from the Fund. If an application for compensations exceeds 1 million finnmarks, the Council of State decides whether compensation should be paid.

Obligation to compensate for water pollution. Industrial operations may cause water pollution of a general nature that cannot be prevented or the prevention of which, for various reasons, is not expedient. Under

the Water Act, an applicant may then (depending on the nature of the pollution) be ordered to pay the State a fish management fee, a water protection fee or a water level regulation fee. In financial terms the fees are of minor significance (e.g. only about 2.5 million finnmarks a year in fish management fees and water protection fees), and they are thought to have little effect. Their efficiency is reduced by delays in legal proceedings.

Private environmental risk insurance. Ordinary liability insurance covers pollution only in the case of a sudden and temporary event. It does not cover pollution that proceeds gradually, such as that which harms persons or property, and health hazards or corrosion caused by liquids, gases or radiation. Many insurance companies in Finland have already developed liability insurance, in the same way as companies in other countries to cover such emission damage. However, this is a voluntary insurance and it does not cover damage that was known of in advance, that could be anticipated or was caused by an action permitted under the Water Act. Nor does it cover damage caused by neglect of regulations concerning environmental protection. Industry and communities may take out a further extended liability insurance to cover against sudden pollution. Some insurance companies often include environmental risks in their risk analyses.

Insurance against environmental risk raises many theoretical and practical problems, solutions to which have not yet been found in Finland. These problems include the need to interpret the implementation of the Polluter Pays Principle within the context of this insurance, problems of legal procedure arising of the lack of uniformity in the legislation, questions of compensation and even vagueness in the definition of the relevant concepts. The supervision of insurance and the questions of whether insurance should be made compulsory have not been given thorough consideration. Other problems related to the operation and development of insurance include the fact that pollution is the result of many simultaneous actions, the difficulties of establishing who is responsible for pollution, the long-term manifestation of pollution effects and the difficulties of predicting the nature of such effect. Assessing pollution in financial terms is also difficult, and often even impossible.

Close-down compensation. So far no Finnish production plant has had to close down purely as a result of the pollution it has caused, and there are no compensation procedures for such cases. Compensation principles in such cases.

9.5 Effectiveness, efficiency and benefits of pollution control measures

The economic assessment methods most commonly used to aid the planning of pollution control measures are cost-benefit and cost-efficiency analyses in their various forms. These methods can be used as aids to administrative decision-making in the planning of national environmental protection programmes as well as regional, local and sectoral measures. They have, with the exception of water pollution control measures, been used relatively rarely in Finland in the planning of environmental protection measures. Even in water administration, economic assessment methods have been developed and used more widely in the course of water construction projects than in the planning of water pollution control

measures proper. An account follows of the economic assessment used in planning environmental protection measures at various levels and of the projects for development of such methods.

Economic assessment of measures in **national** environmental protection programmes in Finland has so far applied to water pollution control only. The programme of goals for water pollution control up to 1985 made by the National Board of Waters in 1974 looked into the costs of measures required for prescribed qualitative goals in the case of industry and communities. A study is at present being made by the Advisory Committee for Water Management in connection with a new programme of objectives for water pollution control. So far no in-vestigations have been made at a national level into cost effectiveness in other sectors of environmental protection. However, ways of reducing sulphur emissions are being studied by the Sulphur Commission.

Most studies of the costs, benefits and effectiveness of measures have been made by the water administration in connection with **regional and local** projects. A comparison must be made between the advantages and disadvantages involved in the planning of water construction and water pollution control measures: this includes economic assessment. Under the terms of the Water Act, comparison must be made when applications are submitted for licenses for water construction or for discharging waste water into waters. A condition for construction projects is that the benefit derived from the project must be considerably greater than the ensuing pollution, damage or other disadvantages. One condition for waste water is that the damage caused must be such that it can be considered small relative to the benefits, and the removal of waste water or other pollutants is not possible by any other method at reasonable cost.

To make it possible to compare alternatives the National Board of Waters has issued instructions and reference examples to help investigate the economic effects of projects and the consequences of damage caused to fisheries, recreational potential, land values, etc. The effects on recreational use have also been assessed by means of willingness-to-pay studies. The effects of projects have often been studied in planning major regional water construction projects by the input-output method.

Finland seems to have made more use of the system of comparison of benefits in water pollution control than many other countries. The effectiveness and benefits of the costs of water pollution control measures have been studied in connection with the master and project planning of the water administration. Regional and local projects have been studied and economic studies have also been made of water pollution control alternatives for a forest products industry operating in a particular water course.

Considerable work has been done to develop ways of investigating the benefits of economic assessment methods in water pollution control. During a research project required for a water pollution control loan granted by the IBRD, the National Board of Waters set out to determine the criteria, concepts and related problems of assessing the benefits of water pollution control to improve assessment in practical planning. In the Project on Industrial Water Pollution Control (TESI 9.2) made by the Finnish National Fund for Research and Development (SITRA) the benefits were assessed especially in a project concerning methods for assessing the

state of waters. Certain separate investigations by **sector** have been made in connection with development projects. The Project on Industrial Water Pollution Control looked into the costs and effects of environmental protection measures taken by the pulp and paper industry in the 1970s (TESI 7.1). The Ministry of the Interior commissioned a study of the costs and effects of air pollution control by the pulp and paper industry with specific emission-reduction scenarios from 1978 to 1985 and 1990.

A few studies have been made of the costs and benefits of **nature conservation programmes.** To estimate their benefits, studies have been made of the general cultural significance to tourism and supplementary occupations in agriculture of nature conservation measures, recreational use, and benefits more readily assessed in financial terms. Costs are incurred, for example, by the purchase of nature reserves and by various forms of compensation (e.g. loss of municipal tax revenue), chiefly to the State, as economic losses when areas are no longer available for full-scale economic exploitation (loss of timber felling potential, etc.) and as loss of jobs. As a general assessment it has been proposed that nature conservation has not placed any significant economic restriction on social development. Few jobs have been lost as a result of conservation, but on a local level the effect of these losses has not been negligible. New jobs, on the other hand, are created by the need to manage nature conservation areas and by the support such areas give to tourism.

The effectiveness of costs and benefits has also been studied while investigating the effects on the environment of large reservoirs, nuclear power stations, waste disposal sites and the building of electricity power lines. Economic assessments dealing with conservation have also been made in the course of the planning of measures with an impact on the environment by other administrative sectors (such as the National Board of Public Roads and Waterways), but, as is generally the case with conservation these have also been inadequate. The integration of environmental policies into other sectoral policies is in this context, however, in the beginning.

The indirect economic effects of pollution have been studied in the context of the projects outlined above and individually. The Technical Research Centre of Finland has investigated the effects of deterioration in the quality of water on the value of lake-side property and the recreational use of waters, and the effect of road traffic noise on the value of housing.

The development and use of economic assessment methods to support the planning of cost effectiveness and benefits and other environmental protection measures are unsatisfactory. Despite the experience of the water administration, the present state of the economic assessment methods for water pollution control methods is insufficient. The results of profitability comparisons often extend only as far as decisions made by the water authorities and only influence the ultimate measures for protection of the aquatic environment indirectly.

The public's interest in participating more directly in environmental decisions has grown with the increase in 'soft' values (see chapter 6.2). In the presentation of this growing commitment, conventional cost-benefit analysis is not regarded as satisfactory or sufficient method for supporting decision-making. This is also because it is based only on the assessment

The public's interest in participating more directly in environmental decisions has grown with the increase in 'soft' values (see chapter 6.2). In the presentation of this growing commitment, conventional cost-benefit analysis is not regarded as satisfactory or sufficient method for supporting decision-making. This is also because it is based only on the assessment of effects in financial terms. Multi-criteria decision-making models and other models drawing widely on cost-benefit analysis, but extending far beyond, it have aroused widespread interest in Finland. By computerizing such models, it is possible to make a rapid analysis of the economic effects of project alternatives, of other social effects and of the views and attitudes of various interest groups. Encouraging results have already been obtained in the use of multi-dimensional criteria methods in investigating the profitability of local environmental projects (study of the alternative uses of nature in the Lestijoki Project; part of Unesco's "Man and the Biosphere" programme and financed by the Academy of Finland by means of concordance analysis). The application of new decision-making methods is being developed and these models will also be applied in the on-going National Board of Waters project on the social effects of water pollution control. The aim of this project is to permit the wider participation of various interest groups in the future planning of water pollution control measures.

9.6 Economic impacts of pollution control

9.6.1 Macro-economic impacts

No investigation of the macro-economic impacts of pollution control covering all aspect of pollution control (air, water, waste) has been made in Finland. The only investigation to date using comprehensive economic models of the macro-economic impacts of pollution control was made into investments in water pollution control.

In 1975-1978 the National Board of Waters carried out a research project, specified as o condition of the water pollution control loan from the IBRD, into the macro-economic impacts of a specific water pollution control programme for 1976-1982. The calculations drew on actual data for recent years, on estimates and forecasts. The macro-economic model used was the medium-term forecasting and planning model (KESSU) of the Ministry of Finance's Economic Department and it looked at the effects of increased investment and costs on demand, prices and the budgetary position of central and local governments.

The main results of the study are presented in Table 30. They show that the effects of the water pollution control investment programme on selected macro-economic variables (such as GDP, gross investments, imports, consumer prices, unemployment) are marginal. The study supports the conclusion, reached in other empirical studies carried out in OECD countries that the economic performance of a country is not constrained by an environmental programme.

Future investigation of macro-economic effects will demand greater knowledge of the costs of environmental protection measures in different sectors and the development of research methods (e.g. to include factors difficult to measure in financial terms). An interesting project dealing

with macro-economic models in this sector is currently being carried out in Finland. This is the FMS input-output model system at Oulu University. The model is being developed to study the effects of energy conservation on pollution, the effects of environmental protection on electricity consumption and the effect of alternative forms of electricity production on the environment. The project is being financed by the Ministry of Trade and Industry and Ministry of the Environment and Academy of Finland.

Table 30. **Impact of water protection investment programme on various national income account items, relative volume changes (per cent) and the impact on private consumption prices, the current account, the demand for labour, State finances and local tax scales. (Differences between levels with and without the investment programme.)**

	1976	1977	1978	1979	1980	1981	1982
GDP at market prices	0.3	0.3	0.5	0.5	0.5	0.6	0.6
Imports	0.4	0.4	0.8	0.8	0.7	0.9	0.9
Total supply	0.3	0.3	0.6	0.6	0.6	0.7	0.7
Exports	-	-	-	-	-	-	-
Private consumption	-	-	-	-	-	-	-
Public consumption	-	-	-	-	-	-	-
Investment	1.1	1.2	2.2	2.4	2.3	2.7	2.6
- private	0.8	1.0	2.0	2.3	2.2	2.6	2.6
- public	1.9	1.9	2.8	2.8	2.7	2.8	2.8
Total demand	0.3	0.3	0.6	0.6	0.6	0.7	0.7
Private consumption price index (per cent)	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Current account, mill.FIM, 1975 prices	-150	-130	-280	-320	-360	-430	-490
Demand for labour, 1000 persons	3.5	4.0	6.0	6.5	7.0	7.5	7.5
State budgetary surplus, mill.FIM, current prices	0	20	60	60	50	70	70
Rise in local tax scales, increase in Finnish pennies	0.1	0.2	0.2	0.2	0.2	0.2	0.2

Source: Publication of the National Board of Waters, no 26. Helsinki 1978.

9.6.2 Economic impacts at the corporate level

Only a few studies have been made in Finland of the economic impacts of pollution control measures at the corporate level. The Project on Industrial Water Pollution Control (TESI) looked into the significance of pollution control costs to industry and society's potential for promoting environmental protection by supporting enterprises and liability charges. The Advisory Committee for Water Management has examined the economic effects on business of pollution control. These effects have also been assessed by the Central Association of Finnish Forest Industries.

The TESI project first analyzed ways of calculating the costs of environmental protection and finally decided to apply case analyses and calculations based on unit functions. The enterprises examined were seven pulp and paper mills, one inorganic chemical company, one iron and steel company and one leather goods company. The environmental protection costs incurred by the enterprises were examined from a theoretical point of view (computing potential, financing and profitability calculations, etc.) and empirically (environmental protection measures by the forest industry in the 1970s by sector and on the basis, for example, of annual reports).

The results show that enterprises have been forced for financial reasons to postpone projects, even those recognised as essential. An inquiry revealed that investments in pollution control account for 8.3% of all investments. With annuities calculated on the basis of the replacement values of environmental protection investments, as 1.7% and operating costs as 0.7% of the turnover for 1978, the overall effect of environmental protection costs came to 2.4% of the turnover. There were, however, major differences between enterprises.

According to the TESI study, pollution control measures may, have an appreciable influence on the economy and competitive standing of an enterprise. The study summary underlines the necessity of investigating the theoretical problems of calculating pollution control costs. (A shortage of funds prevented the project from looking into the potential for pollution control by means of financial assistance for enterprises and liability charges.)

The investigation made by the Advisory Committee for Water Management calculated and estimated the costs of water pollution control and its effects on profitability and financing in the wood processing industry 1974-1982. The data on water pollution control investments were taken from the water statistics for industry maintained by the National Board of Waters. The data on economic activities by enterprises were taken from the public balance sheets published by enterprises and edited by the cash-flow-analysis method.

The average expenditure on water pollution control by all the enterprises was 0.53% of their turnover in the period under review, the impact on the gross capital earnings being 0.29% and the credit repayment capacity 0.57%. Water pollution control investments represented on average of 3.6% of all (net) investments by enterprises. The calculated profitability and financing effect can, according to the study, be regarded as the upper

limit, because the basic assumption of the absence of any price impact may be unrealistic. The study also examined the reliability of the figures obtained and the feasibility of the assumption about the nature of investments using statistical models.

The problems of determining costs and the economic effects of pollution control expenditures at the corporate level are clearly evident from the discrepancies in the results produced by the investigations quoted. Some sectors have produced even more discrepant results. According to the Central Association of Finnish Forest Industries water pollution control investments have represented 12% of all investments by the wood-processing industry. Even though investments in environmental protection are not very large in proportion to this industry's position in the GNP, the costs involved have from time to time been significant in certain sectors and individual enterprises. As most of the investigations point out, the economic effects of environmental protection measures at the corporate level should be examined more systematically, and sufficient resources should be allocated for the purpose, which would also help to develop measures for pollution control by industry.

The economic effects on business of pollution control can also be examined by studying the decision-making process in industry for pollution control measures. The Ministry of the Environment commissioned the Helsinki Research Institute of Business Economics to study factors influencing the choice of technology for pollution control, such as the significance of public financial assistance in making the choice. The results of the study will be utilized in the work of the ad hoc Committee an Environmental Economics appointed to develop the use of economic instruments of pollution control.

9.7 Research

The state of research into environmental economy in Finland is poor. There is no university chair in environmental economics, there is little instruction, and few students go on to take higher degrees in it. The absence of theoretical research and a research tradition is reflected in environmental economics research into service to administration; the quality of the little research there is varies.

Developments in this field will be examined here on the basis of forecasts by the ad hoc Working Group looking into the development of environmental research and the research analysis made in conjunction with the group's work.

Some major research projects were carried out in various sectors of environmental administration towards the end of the 1970s. These projects involved environmental economics studies supporting administrative measures. They include the research project carried out by the National Board of Waters specified as a condition of the water pollution control loan from the IBRD (1975-1978), the Ministry of the Interior's investigations into air pollution control by the industrial sector (TIST, 1976-1981), the SITRA Project on Industrial Water Pollution Control (TESI, 1976-1981), the SITRA municipal water and environmental project (1974-1977), and research into the effects of reservoir and integrated water resources development planning (National Board of Waters).

The economic investigations, which were an integral part of in the IBRD and TESI projects included studies of the costs of water pollution control, the benefits to be derived from expenditure, economic guidance and the macroeconomic consequences. Other projects were mainly limited to technological-economic investigations. The aim of the research was not to create an environmental economic research programme covering different sectors.

The central themes of research into the **costs of environmental protection** have included institutional costs,the economic assessment of pollution and the costs of treating pollution.

There is no generally accepted definition of environmental protection investments and expenditure by **enterprises.** Yet definitions are needed, both for economic guidance and for other administrative planning and decision-making. Studies should be based on previous research (especially TESI 7.2), and research in progress. Cost surveillance should then be arranged. For cost data on environmental protection measures by **communities,** a study should be made of the potential for developing municipal management accountancy by altering the structure of the Recommendation of the Committee on the Renewal of Municipal Accounting (the so called 'KULAUS' recommendation) to satisfy more fully the demands of administration. In other words, the environmental protection expenditure and income of the municipalities should be placed under separate headings in the municipal account.

In future the **economic effects of pollution** will probably be assessed in the context of the Finnish Research Project on Acidification. One important item will be the study of the economic effects of damage to timber growth caused by increasing acidity. The development of methods for studying the costs of pollution is important to be able to estimate the benefits of pollution control in terms of damage avoided. A systematic study of the costs incurred in the **treatment of pollution** should also be started. Items for investigation include the treatment of pollution, the costs of environmental restoration and compensation, measures to improve the quality of the water and the air, oil pollution treatment costs and compensation and health care costs.

Research into the implementation and application of the **Polluter Pays Principle** is called for in order to develop economic instruments and guidance and examine the impacts of pollution control measures on international trade. Research into the **financial assistance and other economic instruments and guidance** is also of current importance for the newly appointed ad hoc Committee. It would also be useful to combine research and experiments in the use of various economic guidance instruments with the Committee's work.

It will be important to develop analyses of the **benefits and effectiveness of expenditure** even though it is not often possible (because of the difficulty of measuring benefit, etc.) to state the most economical alternatives. The potential of other methods supporting decision making, especially multi-criteria decision methods, should also be examined.

To determine the **overall economic effects of environmental protection** it is necessary to examine the potential development of models developed

and used in Finland for making medium and long-range economic forecasts in such a way that environmental factors can be taken into consideration. The work being carried out on the FMS model at Oulu University is particularly important in this respect. Another important field of research connected with overall economics is the link between pollution control measures and **economic fluctuations,** including anti-cyclic policy (e.g. the potential of environmental policy in stabilizing the economy).

Interest in the **economic effects** of pollution control measures **at corporate level** is growing steadily. The effects on the profitability, competitiveness, productivity, employment, etc. of enterprises should be examined for the development of economic guidance and other administrative purposes.

The links between environmental protection, **households and consumption** have been studied to some extent, mainly at the Helsinki School of Economics. Studies should be made of consumers' habits, behaviour and attitudes to products favourable and unfavourable to the environment. This would provide basic information for developing the guidance of measures influencing production and consumption.

National income accounting is difficult especially with respect to environmental factors in the **national account system.** It is nevertheless an important item for research that has received little attention in Finland so far. The Central Statistical Office and the Ministry of Agriculture and Forestry recently embarked on a fairly extensive project for developing a **natural resource accounting** system. Measuring factors connected with environmental protection and welfare will call for more advanced theoretical research. Another important item is economic research into **the low and non-waste technologies,** including the productivity of raw material and energy inputs (being studied at the Economic Planning Centre), economic research into waste re-use and recycling as well as clean technology innovations.

Little economic research into global environmental issues has been conducted in Finland. This is a subject closely connected with research into economic and other relations between industrial and developing countries. The Ministry of the Environment and the Ministry for Foreign Affairs have together begun to study ways of including environmental aspects in the policy towards developing countries and development cooperation projects.

The first task in the **general development of environmental economics** is to draw up a research programme The ad hoc Working Group for the development of environmental research proposed that the Ministry of the Environment, in cooperation with the Academy of Finland, draw up a programme for public research and further education in environmental protection. Such a programme would help to develop the sector and to raise the standard of the expertise required in environmental administration. This work has been planned in the ad hoc working group of the Academy of Finland.

According to the Working Group the Ministry should also be granted the necessary funds for the promotion and extension of economic and juridical research in environmental protection to be carried out at university level with a view to administration. To develop training it is

necessary to investigate researchers' interest in further education at foreign institutions, thus guaranteeing a future supply of qualified teachers. Instruction in environmental economics should be extended to various universities and colleges of advanced education. International researcher exchange should also be introduced in the field of environmental economics.

9.8 International cooperation

Finland takes an active part in international cooperation in the field of environmental economics through the OECD, the ECE and the environmental protection of the Nordic Council of Ministers through working groups, seminars, conferences and projects. The most visible cooperation has been in water pollution control. Because of the shortage of resources and her short research tradition Finland's contribution to international cooperation has, however, been more modest than that of the other Nordic countries.

V SUPPORTING ACTIVITIES

10 ENVIRONMENTAL RESEARCH, IMPACT ASSESSMENT AND MONITORING

10.1 Research and development

10.1.1 Background

Funds have been available for environmental research since the beginning of the 1970s. Before that, environmental research was carried out primarily as part of research in natural, medical and social sciences or as an extension of research in forestry and water management. Initialls, funds available for environmental research were very limited and distributed over a wide range of small projects. Policies for long-term and systematic development of environmental sciences and research were not adopted until the 1970s.

The Academy of Finland established a Division for Environmental Research as part of the Central Board of Research Councils in 1971. Research funding as well as environmental research planning increased quite favourably in years that followed. A permanent Research Council for Environmental Science was established by the Academy in 1983. The funds available for the Council amounted to approximately 2.4 million finnmarks that year. Together with the increased research activity, environmental education in schools and universities and was developed.

General environmental research financed by the environmental authorities was begun as recently as in 1978. The Ministry of the Interior, then responsible for the overall planning and development of environmental protection, used some 100 000 finnmarks for environmental research during that first year. The research funds, however, were doubled or tripled during the proceeding years, reaching the 4 million finnmark-level by 1983, when the responsibility for environmental protection was taken over by the Ministry of the Environment.

During these years of rapid expansion, the Ministry of the Interior, partly with the assistance of the subsidiary councils and advisory committees working with the ministry, produced several programmes for the systematic development of different sectors of environmental science and research. At the same time, environmental research was also expanded by other related governmental bodies, such as the Ministry of Agriculture and Forestry, the Ministry of Trade and Industry, the National Board of Waters (the Water Research Institute), the Finnish Institute of Meteorology, the Technical Research Centre of Finland, and by the universities.

10.1.2 The organization of environmental research

An overview of the decision-makers, sources of funds and performers of research in the public sector, as well as of the overall research administration, is given in Figure 26.

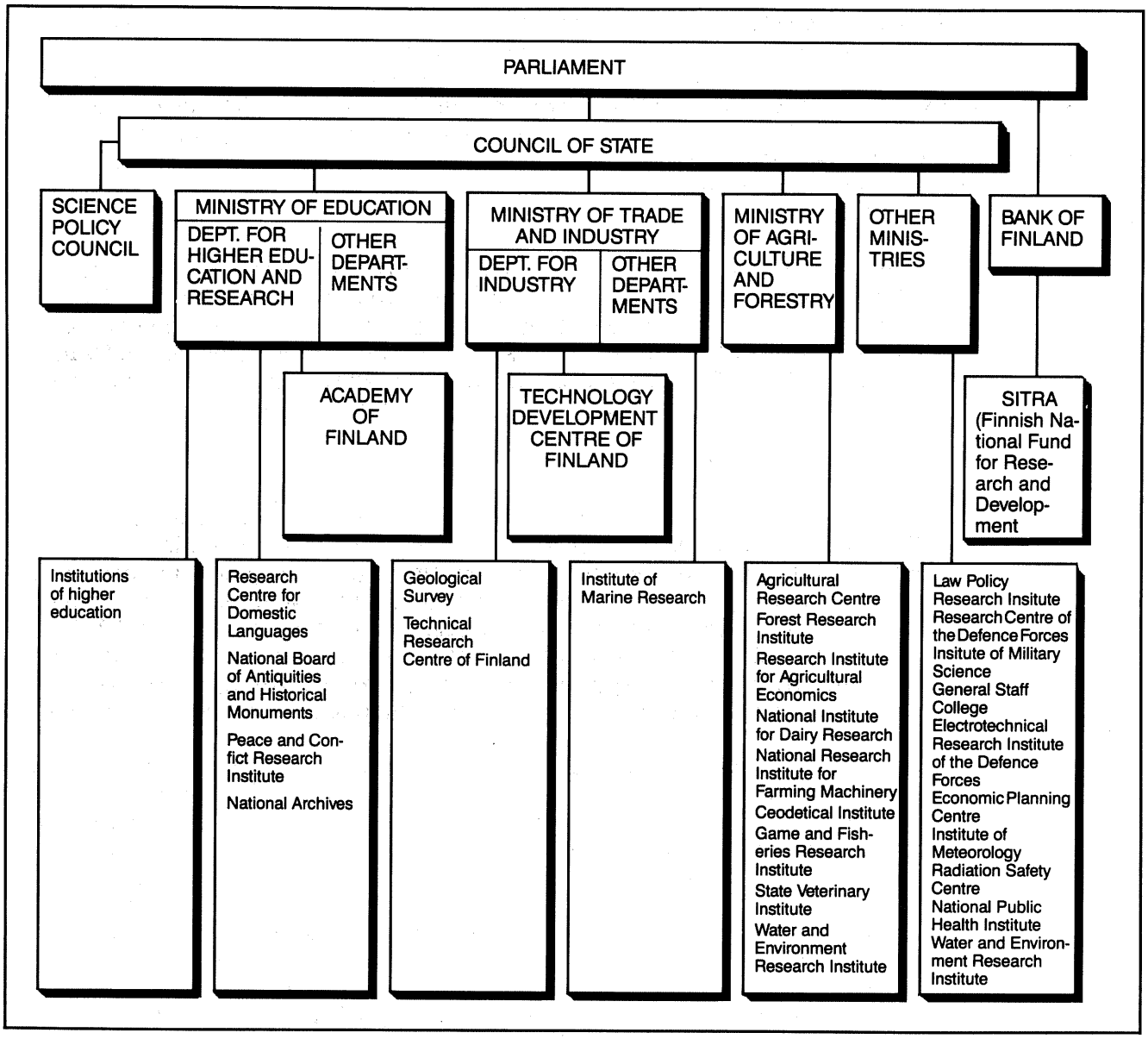

Figure 26. Research administration in Finland.

At present, the main financers of environmental research are the Ministry of the Environment, the Academy of Finland, the Ministry of Agriculture and Forestry and the Ministry of Trade and Industry. The main research institutions are the Water and Environment Research Institute, the Institute of Meteorology and the Technical Research Centre of Finland, which preside over environmental research funds of their own in addition to funds received from external sources.

The Science and Technology Policy Council has overall responsibility for the advancement of science and research in Finland. The Ministry of the Environment and the Academy of Finland are the main policy-makers in the field of environmental research.

Until recently he Ministry of the Environment had no environmental research institutes of its own, utilizing instead the know-how and expertise of the universities and of the research institutes superwised by other administrative sectors. However, the Water Research Institute was transferred to the Ministry of the Environment in 1986 and the Water and Environment Research Institute, dealing more generally with environmental research issues.

10.1.3 Policy objectives

In the beginning of the 1980s environmental research and development studies were named as areas of special attention within research related to social policy and services. The Government Report on Environmental Protection precented to Parliament on 28.9.1984 stated the objectives for environmental science and research. According to the Report resources for research into environmental protection will be increased substantially to make the following tasks and goals possible:

- the production of reliable data on the state of the environment and the way in which it is developing, with the particular purpose of creating a basis for decision-making;
- accurate forecasts concerning the kinds of foreseeable environmental problems and proposals for dealing with them;
- increased expertise in the field of environmental protection on the part of the public authorities;
- the development of measures for counteringenvironmental problems;
- the promotion of environmental research in research institutes and universities with the purpose of supporting public administration;
- the co-ordination of environmental research activities with the aim of optimizing the use of the resources available, and
- the promotion of international co-operation in the field of environmental science.

For the coordination and promotion of environmental research an advisory board will be established. The Report further stated that, in addition to the development of environmental research itself, other research should also pay more attention to the requirements of environmental protection and to attempts to achieve sound and balanced exploitation of natural resources.

Questions about the research applications featured prominently in the above Report and in the development plans. The objective is to intensify the utilization of research results by the Ministry of the Environment. Exchange of information research institutes, the institutions of higher education and environment authorities could be improved by appointing specific environmental research liaison officers. It has also been

suggested that an environmental library be established at the Ministry of the Environment.

10.1.4 Funding of environmental research

The primary sources of funds for science and research are listed in Table 31.

Table 31. Environmental research expenditures by sourcer of funds (1986).

Source of funds	Million FIM
Ministry of the Environment	18.6
- Water and Environment Research Institute	15.0
Academy of Finland	12.4 [1]
Ministry of Agriculture and Forestry	5.7
Ministry of Trade and Industry	8.0
Finnish Institute of Meteorology	10.0
Technical Research Centre of Finland	5.0
Universities	5.0 [2]
Private funds and others	3.5
Total	83.2

1) Most of the funds channelled to the universities.
2) A gross estimation of the budget funds.

10.1.5 Main fields of research

The bulk of the public are thus allocated to research in water management and air pollution control, impact of air pollution and acidification (the Finnish Acidification Research Project, HAPRO included). Other fields of environmental research, including such important new sectors as the environmental monitoring system, environmental economy, environmental impact assessment, noise abatement, environmental technology and environmental recreation, together account for about 15% of total public expenditures.

Table 32. Distribution of research funds granted by the Ministry of the Environment in 1983-87.

	1983	1984	FIM 1985	1986	1987
Development of the environmental monitoring system	100,000	100,000	500,000	500,000	1,500,000
Air pollution control	920,000	1,640,000	1,100,000	1,200,000	1,700,000
Acidification research project (HAPRO)	-	150,000	4,550,000	4,700,000	5,600,000
Waste management, recycling and re-use of wastes	1,200,000	1,200,000	1,600,000	1,800,000	2,600,000
Noise abatement	150,000	100,000	250,000	250,000	400,000
Environmental impact assesment	-	-	200,000	200,000	250,000
Hazardous chemicals	200,000	350,000	400,000	500,000	700,000
Environmental effects of pesticides	-	-	200,000	320,000	500,000
Water management	- [1]	- [1]	3,600,000 [2]	3,380,000 [2]	1,610,000
Protection of the marine environment	100,000	200,000	200,000	220,000	250,000
Outdoor recreation	110,000	50,000	50,000	50,000	50,000
Nature conservation	600,000 [3]	200,000	400,000	600,000	600,000
Environmental technologies	-	150,000	-	150,000	400,000
Land-use planing	1,330,000	1,780,000	2,380,000	2,700,000	3,000,000
International research co-operation	100,000	150,000	200,000	400,000	400,000
Others	320,000	400,000	400,000	790,000	500,000
Total funds granted	5,130,000	6,470,000	16,030,000	18,610,000	22,906,000

1) Financed by the Ministry of Agriculture and Forestry; transferred to the Ministry of the Environment in 1985
2) Includes salaries of permanent research workers
3) Funds granted jointly by the Ministry of Agriculture and Forestry and the Ministry

The main fields of environmental research are financed from different financial sources, as follows:

Ministry of the Environment. The research funds are directed mainly to water management and protection, air pollution control, land-use planning, waste management and recycling and re-use of waste. In 1984 a joint five-year project dealing with the acidification of the environment (the Finnish Acidification Research Project, HAPRO) was launched by the Ministry of the Environment and the Ministry of Agriculture and Forestry.

New environmental problems, the diverse needs of society and advances in various branches of science continuously create new research needs. At precent the aspect of environmental protection most urgently requiring research are the monitoring of the state of the environment, environmental impact assessment, control of harmful or toxic substances, environmental hygiene, noise abatement, non-waste and low-waste technology and the assessment of the environmental impact of development cooperation projects.

Ministry of Agriculture and Forestry. In addition to research concerning acidification of the environment, the Ministry finances research into the protection of natural resources (e.g. forests, agricultural areas and water). The Forest Research Institute and the Agricultural Research Centre, both under the Ministry of Agriculture and Forestry, will how-ever, be of primary importance to environmental science and research in the future.

Ministry of Trade and Industry. In the environmental field, the Ministry primarily grants funds to research into assesment of the environmental impact of energy utilization, such as air pollution control and energy conversion processes. A part of the funds goes to the Marine Research Institute, which is administrated by the Ministry.

The Academy of Finland. With the establishment of the Research Council for the Environmental Sciences in 1983, the Academy of Finland greatly improved its ability to finance environmental research systematically. Applications for funds are normally made by individual researchers or research teams in the university sector as well as by some governmental research institutes. The Academy mainly finances basic research and research related to the development of new methods, but same funds go to education as well. The Academy of Finland sees low- and non-waste technology and other projects relating to environmentally sound technology a crucial field of research in the coming years.

The Finnish Institute of Meteorology. The Institute, under the administration of the Ministry of Communications, has long been the most important research institute in the field of air pollution control. The Institute has some funds of its own for research and development in this field and receives substantial support from other sources as well, including the Ministry of the Environment.

The Technical Research Centre of Finland directs its research activities in the field of environmental technology towards reducing the harmful effects of technology on the environment. In some areas such as waste management and air quality monitoring, the Technical Research Centre

assumes the role of an official expert institute. The Centre directs some of its own funds to research and development projects in environmental technology, in particular low and non-waste technology, process development for pollution control and development of measurement equipment and systems as well as mathematical modelling of the release of pollutants into the environment. A research programme of the Centre, supported by the Ministry of the Environment and the Ministry of Trade and Industry, focuses on the development of energy conversion processes and emission control devices.

Table 33. Distribution of funds for environmental research granted by the Academy of Finland in 1983-87.

	FIM				
	1983	1984	1985	1986	1987
Environmental monitoring	500,000	1,020,000	1,890,000	2,020,000	1,310,000
Nature conservation	190,000	250,000	590,000	600,000	910,000
Water resources	640,000	1,810,000	2,550,000	4,240,000	4,350,000
Air	450,000	80,000	750,000	660,000	1,400,000
Noise abatement	30,000	-	-	-	-
Waste management	-	-	-	-	-
Soil projection	150,000	-	850,000	1,090,000	1,500,000
Hazardous substances	1,400,00	1,450,000	1,580,000	2,200,000	2,480,000
Living conditions	300,000	1,060,000	310,000	900,000	840,000
Environmental decision-making	110,000	220,000	300,000	640,000	630,000
Environmental research on developing countries	20,000	-	100,000	90,000	130,000
Others[1)]	1,030,000	620,000	560,000	20,000	70,000

[1)] Classification has become more exact during the years diminishing the number of projects in the class "others".

The universities use the bulk of their own funds for environmental research primarily for basic research and projects relating to the education of scientists. The universities also receive financial support for this purpose from the Academy of Finland and the Ministry of the Environment.

Private funds, independent research institutes and research institutes in the business sector constitute an important part of the environmental research community in Finland, even if their relative importance has been decreasing in recent years as a result of increased government spending on environmental research. Most private funds have been directed towards technological research and innovation projects as well as subjects of commercial interest.

10.1.6 Planning and coordination

Environmental research planning has been developed during the last decade only. During the late 1970s the Academy of Finland issued some general guidelines for the development and funding of environmental research. Specific environmental research programmes were developed by the Ministry of the Interior and later by the newly-established Ministry of the Environment, with the assistance of the subsidiary councils and advisory committees working in conjunction with the Ministry. To date, environmental research programmes have been issued for the waste management sector, the noise abatement sector and the water management sector.

Coordination of environmental research activities and funding is carried out by the Academy of Finland primarily in the universities - as well as by the Ministry of the Environment. The latter is currently considering the establishment of an advisory board for environmental research, linking together the main sources of environmental research funds and the most important research institutes. The establishment of this advisory board and the overall development of research coordination has been somewhat delayed bacause of staff shortages and organizational reasons.

The Ministry of the Environment has established an environmental research register, which will become fully operational in the next few years. The utilization of environmental research data has been greatly improved by the development of an environmental information service in the Ministry, which makes it possible to make use of the main international data banks and research registers.

10.1.7 Current problems and aims for the future

The comparatively short history of environmental research is seen in the lack of a research tradition, trained personnel or adequate laboratory equipment in many vital fields of activity. Finland's science policy during the 1960s and early 1970s focussed on the development of regional universities and research facilities. This tendency to decentralize research resources had a slightly adverse impact on the development of traditional environmental research institutions.

Growing understanding of the importance of advanced science and research in the late 1970s and early 1980s was of pasticular benefit to technological research, which has developed at an unprecedented rate during the last decade. One example of this policy was the establishment of the Technological Development Centre (TEKES) in 1983.

The main tasks of TEKES are to plan and prepare technology policy according to the guidelines laid down by the Ministry of Trade and Industry and to allocate funds to enterprises for product and process method development and to other technological research. The Centre also promotes information, education, and advisory activities in its field. So far, with a yearly budget of 250 million finnmarks, TEKES has supported a few projects with the specific objective of developing environmentally sound technology, such as low- and non-waste technology or pollution control technology. One of the central aims in the next few years will be to incorporate environmental objectives into the policies of TEKES.

In the recently conducted OECD review of Finland's science policies, attention was drawn to the lack of experienced scientists in some fields and to the need for a re-organization of postgraduate studies as a crucial condition for future scientific and technological development in Finland. The need to make postgraduate studies effective is especially evident in the field of environmental research, where today there are few, if any, opportunities to specialize at doctorate level.

In spite of the comparatively rapid increase in funding for environmental research in recent years, the bulk of the resources are directed to a few important fields of research. Bacause the development of new activities, such as noise abatement, environmental monitoring or environmental impact assessment, is almost totally dependent on research funds, more resources should be allocated to research into these new activities in the future. The limited research funds available for these activities, combined with the shortage of scientists in some fields of activity as well as research facilities and traditions, precent an urgent problem. Any comprehensive solution must be based on close cooperation between the environment authorities, the universities and the research institutions. This also implies an increase of core funds for basic environmental research and training as well as for the development of scientific information services in the field of environmental research.

As aresult of the organizational changes in the environmental administration, two alternatives have been considered vis-a`-vis the development and reinforcement of environmental research structure:

- concentration of environmental research activities and resources from the various research institutes presently conducting environmental research in the Water and Environmental Research Institute, under the Ministry of the Environment; or

- strengthtening co-ordination and co-operation between environmental research financers and institutes as well as universities to achieve more cost-effective use of research funds and resources.

The latter alternative would, perhaps, provide better possibilities for co-operation between the main financers as well as between the environmental administration and the scientific community. It would, however be dependent on the establishment of strong co-operation a jointly drafted plan of action for development. An advisory board for environmental research, as suggested by the Government in its report tothe Parliament, would be a possible forum for the handling of these matters, which are of crucial importance to the development of a long-term strategy for environmental research.

10.2 Environmental impact assessment

10.2.1 Background

In Finland there is no general legal requirement for environmental impact assessment (EIA). There are a number of acts, however, which contain provisions regarding environmental aspects and the assessment of the environmental consequences of certain activities. Activities which might have an adverse impact on human health or the environment require special licences or approvals by authorities. The more significant acts of this kind are the Planning and Building Act of 1958, the Water Act of 1961, the Public Health Act of 1965, the Waste Management Act of 1981 and the Air Pollution Control Act of 1982. Environmental impacts are also studied during the planning of infrastructure so that approval by the competent authority may be granted. In addition, environmental aspects are taken into account at all three land-use planning levels (i.e regional, municipal and detailed planning levels).

Elements of EIA are included in many current planning and decision-making procedures. Information on environmental impacts has to be incorporated in the application for a licence or in the planning documents. The competent authority requests statements and comments from the other authorities and parties concerned. The public also have an opportunity to comment. In the case of an application for a licence according to the Water Act, a special survey may be carried out depending on the significance of the project. The survey is a kind of EIA procedure comprising public hearings, local trustees and complementary studies.

The existing procedures do have shortcomings, however. As there are no general requirements for EIA, not all activities which might have significant environmental consequences are systematically and thoroughly examined. Despite the number of studies made on environmental impacts, they are carried out independently of each other and their scope varies from case to case. Moreover the studies are made at arather late planning phase. Hence, the alternatives,if any are few, and the project has already assumed a shape which is difficult to change. More detailed and comprehensive studies are often started only when strong public criticism has been voiced. Increasing awareness of environmental matters has brought home to the public the inadequasy of their opportunities to participate in and influence planning and decision-making. There are a number of examples in which the failure to assess environmental impacts during an early planning phase has lead to expensive and time-consuming replanning.

In a few special cases comprehensive environmental impact studies have been made on an ad hoc basis in the early planning phase. An environmental impact statement (EIS) has been drafted and various participation opportunities have been arranged for the local people. This has been the case especially in some major water management projects the latest of them being the development of the Iijoki region, which includes the planning of power plants and reservoirs in the area.

The need to include EIA in planning and decision-making in Finland was first studied by a working group appointed by the Ministry of the Interior in 1981. The working group considered the present system in Finland insufficient in many respects. The greatest defects were the insufficient consideration given to environmental aspects at various levels of planning and decision-making and the sectoral examination of the environmental impacts when requested. In the opinion of the working group EIA should be included in the various levels of planning and decision-making, from the drafting of legislation to project planning.

The working group stressed the importance of examing alternatives and assessing their effects. Monitoring was also considered to be an integral part of the assessment procedure. Further, the working group emphasized the importance of public participation in the early planning phases. According to the working group EIA should cover not only effects on the physical environment but also impacts on citizens and their living conditions.

10.2.2 Progress and further development

The shortcomings of the present planning and decision-making procedures and the need to improve them are generally recognized. EIA is considered to be an efficient instrument in solving many of the problems and conflicts between various interests.

The general development of EIA in Finland is the responsibility of the Ministry of the Environment, but it calls for intensive cooperation between various authorities. The experiences of other countries that have already developed EIA and international cooperation are of paramount importance to Finland. Finland actively participates in projects dealing with EIA in the ECE and in the OECD.

As in other countries, the starting point in Finland is also the development of EIA in project planning. Experience of project planning will be used to extend the field of application of EIA to plans, programmes and legislative proposals. As a basis for the development of EIA in project planning a few case studies and trial runs are being carried out. The objective is to establish a solid framework for current project planning and to conduct practical experiments with an outlined assessment procedure.

Several public bodies, such as the water authorities and highway authorities, have started development work to include EIA in their planning and decision-making procedures. Guidelines for the assessment of environmental impacts resulting from development cooperation projects have been drafted by a working group appointed by the Ministry for

Foreign Affairs. The guidelines follow the OECD recommendation on environmental assessment of development assistance projects and programmes.

On the basis of further studies, research projects and practical experience, the necessary steps will be taken to draw up guidelines and develop legislation. Although some problems can be solved on an ad hoc basis, it is obvious that legislative reforms and administrative orders will also be needed to ensure that all activities with a potentially significant impact on the environment are systematically and thoroughly examined.

10.3 Monitoring the state of the environment

Basically environmental monitoring means gathering reliable data related to different kinds of environmental changes.

Environmental monitoring in Finland is performed independently by a number of governmental research institutes, and in some cases also by universities. In general , though, the role main of universities is to develope new methods of monitoring. The most important research institutes connected with monitoring are the Finnish Institute of Meteorology (air quality), the National Board of Waters and the Environment (water quality in lakes, rivers and coastal zones) and the Forest Research Institute (forest inventories). Monitoring of pollutants is shared between many research institutes, including the National Board of Waters and the Environment, the Game and Fisheries Research Institute, the Agricultural Research Centre (pesticides, fertilizers), the National Veterinary Institute, the Technical Research Centre (analyses), universities, and others.

Many of the monitoring programmes carried out by different research institutes have continued for one or two decades. The majority are mainly concerned with physical and chemical monitoring, biological monitoring is included in only a few of them.

The research institutes mentioned above are supervised by various Ministries. Moreover the different research institutes have their own district organizations which report their monitoring results. This complex organizational structure results in a rather fragmented overall view of the state of the environment. Because of the defects in the current state of environmental monitoring the Ministry of the Environment,established in 1983, outlined an Environmental Monitoring Programme, covering air, land and water. The aim is:

- first, to obtain a better overall view of the current state of the environment and its development by co-ordinating and steering the monitoring performed by the various governmental institutions;
- second, to assist in the preparation of new environmental legislation and other administrative measures, and to monitor the effects of the present legislation and other administrative instruments.

Finnish environmental policy sets out to prevent environmental hazards with the use of an integrated evaluation of monitoring results.

The new Environmental Monitoring Programme consists of the following main aspects:

(1) Monitoring the air

- background (BAPMoN, EGAP, EMEP and national networks)
- regional and rural
- deposition (e.g. heavy metal contents of mosses in the Nordic countries)

(2) Monitoring the land

- national forest inventory
- monitoring the effects of air pollution on forest ecosystems

(3) Monitoring of inland waters

- monitoring lakes and running water
- extensive and intensive monitoring programmes
- fish monitoring
- monitoring groundwater

(4) Monitoring the Baltic Sea

- monitoring coastal waters and estuaries
- monitoring the open sea
- extensive and intensive programmes
- fish monitoring

(5) Monitoring toxic substances in biota

- monitoring programme of toxic substances
- environment specimen bank
- monitoring bird populations
- monitoring endangered plants and animals monitoring the state of nature conservation areas

(6) Integrated monitoring in the Nordic countries

- about 36 small catchment areas (see below) 10 of which are in Finland (figure 27)

(7) Monitoring land-use

- land-use planning
- protection and monitoring of the built-up environment and buildings
- monitoring the use of soil

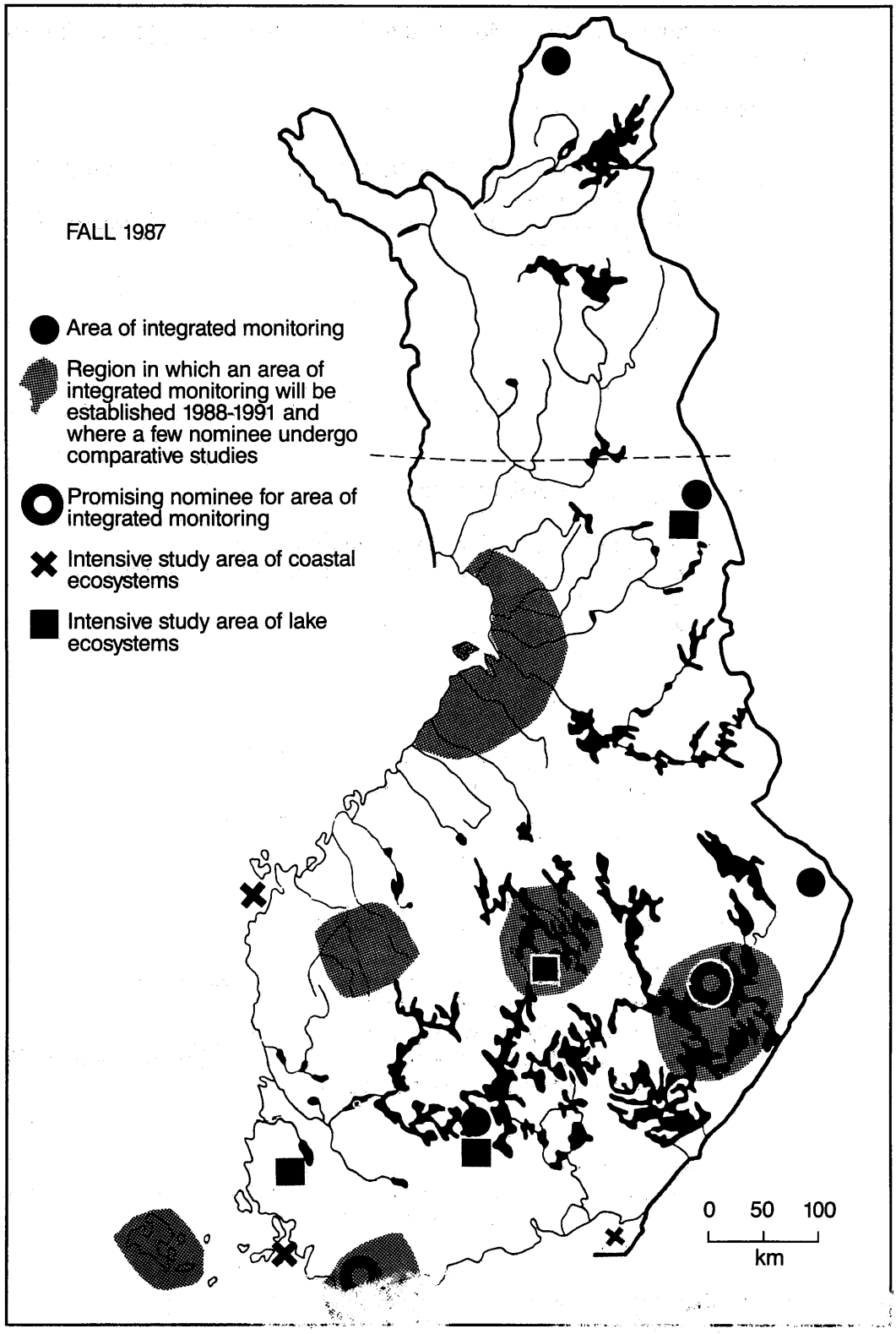

Figure 27. Areas of integrated monitoring and proposed intensive study areas of lake and coastal ecosystems in Finland.

(8) Remote sensing of the environment

The new Environmental Monitoring Programme emphasizes intensitying

- biological monitoring;
- integrated monitoring of air, land and water;
- co-operation between the Nordic countries in matters pertaining to environmental monitoring.

Integrated monitoring is defined as a "simultaneous physical, chemical and biological monitoring of the environment of a particular area".

A network of 36 integrated environmental monitoring areas will be operating in the Nordic countries in 1990. The areas comprise small catchment or drainage areas, where the effects of long-range air-borne pollutants, for example, can be studied. A Nordic Coordinating Data Centre of integrated monitoring has been established in Finland. With regard to the monitoring of pollutants in general, two main goals must be stressed:

- the urgency of assessing the background or baseline values of various pollutants and
- the need for an Environmental Specimen Bank, essential for tracing "new" pollutants in the future.

10.4 Environmental information system

10.4.1 Background

Monitoring the state of the environment and assessing impacts on it create a large set of environmental data which can be used in decision-making by administrative bodies.

The collected environmental data are stored by different research institutes, universities and National Boards in some 100 registers of 30-40 various data systems established for internal use or for other scientific research. The aims defined for the collection of factual data on the natural environment often differ from the data that would be needed for the administrative handling of data in connection with various environmental issues.

10.4.2 Policy objectives

The Ministry of the Environment has initiated a project for developing an environmental information system. The aims of the project include:

- implementation of a central environmental information system for the Ministry of the Environment, National Board of Waters and the Environment and the Environmental Protection Divisions of the Provincial Offices;

- the coordination of other decentralized data bases holding environmental information, so that data from many data banks can be used simultaneously;

- the development of a unique reference code set for environmental data, so that relevant data may easily be handled for different research and governmental purposes;

- the possibility of shared use of factual data on the natural environment and information originating from administrative sources.

The programme for the development of the environmental information system emphasizes:

- the construction of interactive environmental modular subsystems, in cooperation with the data-collecting and data utilizing parties;

- the use of compatible data handling procedures and the need for a unique reference code for environmental data;

- the need to establish one or more environmental data handling units in which the subsystems are integrated and the data transformed to meet the data presentation requirements of the utilizing bodies.

10.4.3 Coordination and expenditure

The programme for the environmental information system enlists 20 subsystems of which a few are already being developed; the entire information system should be operational by the late 1980s.

Coordination of the different environmental data systems is the responsibility of the Ministry, whereas much practical application work will be carried out by the National Board of Waters and the Environment (until October, 1986, the National Board of Waters) and other research bodies.

Ministry of the Environment, Department of Environmental Protection Department

Planning of a departmental system began in 1982. The system will be realized according to an approved plan completed in 1985. The realization has so far made use of microcomputers; the final aim being a system centred on a minicomputer, to be operational in 1988.

The present system development concerns registers environmental research projects, air pollution control and air quality, camping and outdoor

recreation and system units for waste management. Next in line, starting in 1987, are registers for nature conservation, monitoring the state of the environment, water management, noise abatement and general management, These registers will be part of the national environmental data system and in use by 1989 at the latest. The first prototype systems of this kind are almost complete.

The Department has established connections with several national and international reference and factual data banks; these on-line connections will be further strenthtened.

The departmental system will be integrated with the environmental information system, the systems of the National Board of Waters and Environment and the future decentralized system of the Environmental Protection Divisions of the Provincial Offices.

The total funds appropriated for the departmental system in the period 1983-86 were 1,895,000 finnmarks.

National Boards of Waters and the Environment

The present system of the National Board of Waters is built around a mainframe, VAX 8500, with connections to 8 of 11 water districts. The largest registers hold data on water quality, sewage and water resources.

Thorough reconstruction of the computer systems is planned; the aim is to turn the present systems into one environmental information system

The central environmental system enlist 22 separate development projects in 1987-90.

The 1987 implementation plan emphasizes improving coordination between these systems and those planned by the Ministry.

Nordic Council of Ministers

The environmental data group of the Council has worked on characterization of environmental data and a coding system for environmental data. In 1985 a Nordic Coding Centre for environmental data was established. This produces Nordic code lists for various research fields. Some national institutes take part in this work. Within the context of Nordic co-operation a data centre for integrated monitoring is under establishment at the National Board of Waters and Environment.

The joint-Nordic work is funded partly through the Nordic Council of Ministers and partly through the responsible environmental data units in each Nordic country. In the period 1982-1985 the total funding of the Nordic environmental data group was 787,000 Norwegian crowns, which equals about 520,000 finnmarks.

10.4.4 Current problems and future need of resources

The Departmental system, the systems of the National Board of Waters and Environment, other sectoral information systems and the system of the Provincial Offices need to be closely integrated and coordinated to avoid

multiple registration and waste of limited resources. Together they will provide an effective integrated environmental information system.

Coordination can only be achieved if agreements are reached between the many Ministries under which the institutions, universities, National Boards and Offices operate.

Furthermore, a great deal of valuable environmental data are still in manual form; this is especially true of the biological records, which in the near future must be computerized if wide use is to be made of them.

There is also a great need fo a geographical information system in which environmental data can be presented in the form of thematic maps.

Effective use of resources should be aimed at by giving priority to different environmental data projects. This must be done with a longer perspective than hitherto, because the estimated need of resources for developing the systems mentioned in the period 1985-90 are 35 million finnmarks.

10.5 Environment statistics in Finland

10.5.1 Past and present

The need for environmental information in society grew rapidly in the early 1970s, a trend that also affected the field of statistics. The dichotomy between social statistics/economic statistics began to break down, and gradually environment statistics came to be regarded as an equally important means to satisfy the information needs of society.

Among the first public authorities to react to this change was the Central Statistical Office of Finland. A national approach to a system of environment statistics was soon evolved. The purpose of the system was to advance the development and coordination of environment statistics and to serve as a framework for future publications. As early as 1973 this resulted in the publication of one of the first yearbooks of environment statistics in the whole world.

While the yearbook was being compiled, it soon became evident that the environmental data were - and, despite centralized administration, still are - fragmented and poorly coordinated. Environment statistics are produced by about 30 different government authorities, ranging from ministries and national boards to governmental research institutes. In addition, environment statistics and related data are being produced by universities, Provincial Offices, municipalities and some private research institutes.

There are also certain shortcomings in the production of environment statistics in Finland. In particular, the coverage of statistics concerning waste generation and re-use, land use, noise, and environmental protection costs and investments is incomplete.Even in the fields of air and water, on which plenty of basic data are available, the focus has been mainly on the production of what is known as background information, and only recently has more attention been paid to quality data. During the last

few years, however, efforts have been made to eliminate these shortcomings.

The lack of integrated data production means that some statistics related to the environment, for example, those on natural resources, still lack a comprehensive environmental aspect. Moreover, the diversity of classifications, concepts and definitions often impairs the comparability of environment statistics.

10.5.2 Summary of the main fields of environment statistics

The summary describes the precent situation as seen from the standpoint of compiling **generalized** environment statistics.

Air

Nowadays reliable statistics and fairly extensive records are available on the concentrations and depositions of air pollutants at background stations in the Finnish countryside. Observations are being made at 14 stations in four measurement networks. Urban air quality has so far monitored in only a few ad hoc investigations concerning SO_2 levels and concentrations of suspended particles. However continuous, and uniform concentration measurements are now being made, even no NO_K, at least in the largest cities. Figures on emissions in Finland are still based on official estimates. The register for air pollution control set up by the Ministry of the Environment will, however, facilitate the provision of better statistical data on future emissions. There are no data to speak of available on the exposure of the Finnish population to various air pollutants.

Water

Abundant statistics exist on water use and quality in Finland. This is particularly true of the physical and chemical data collected for the water registers maintained by the National Board of Waters and Environment. Water statistics do not, however, contain sufficent data on biological variables, nor on loading from scattered sources.

Natural resources

Fairly reliable statistics exist of the stocks of natural resources, i.e. mineral, forest and energy resources. They are not based on any comprehensive view of the long-term planning and development of the use of natural resources. Hence the Central Statistical Office and the Ministry of Agriculture and Forestry have started a joint project for the development of a natural resources accounting system. The aim of the project is to develop a statistical system taking into consideration macroeconomics including the reserves and use of natural resources and on the effects of their use on the environment.

At the same time, the public authorities responsible for the management of natural resources have broadened their statistical description of natural resources so as to take better account of environmental aspects. For example, the method used earlier in the National Forest Inventories has

been revised to provide better information on the forest ecosystem as a whole.

Wildlife

Information concerning wildlife statistics is available on protected areas and on the use of animal and plant species for economic purposes. Statistics of population dynamics, biotypes and concentrations of toxic substances in animals, which are important in the statistical description of the environment, are either very random or nonexistent. On the other hand, the problems connected with the counting of endangered species have been carefully studied in recent years.

Wastes

Information on waste generation, recycling, and so on has been based either on ad hoc investigations restricted to some individual branches of industry or on estimates made by waste management authorities. In 1982, however, the Central Statistical Office and the Ministry of the Environment joined forces to improve the processing of statistics on solid waste in Finland. At the first stage, priority has been given to the development of a comprehensive waste classification with special reference to industrial wastes. According to present plans, the compilation of regular statistics on solid waste amounts and re-use, and on waste management costs will start by the beginning of the 1990s.

Land use

The development work on land use statistics in Finland concentrates on land use classification and on methodological problems associated with the production of land-use data on built-up areas. However, there are still no uniform land-use statistics of the distribution of different land-use forms within the total area of Finland. In particular, data on gross changes in land use are needed. From an environmental point of view, the project concerning the development of an all-inclusive land information system, started by the National Board of Survey, will be very useful in the future.

Environmental expenditures

In general data on environmental protection measures and costs in Finland are not readily available. Fairly good estimates can be given of governmental expenditures on environmental protection. Reliable information is available on public water supply plant and sewerage costs and investments, as well as on industrial water pollution control investments in Finland. The lack of data is largely due to problems relating to the definition of costs and investments. Recently, the Central Statistical Office and the Ministry of the Environment have made a joint effort to improve the statistics on environmental protection costs and investments in Finland. As part of this effort the Ministry of the Environment has launched a project to establish a uniform definition of environmental costs and investments. In developing economic statistics related to the environment, the purpose is to extend the coverage of these statistics to include economic support for and the benefits of environmental protection.

10.5.3 Development of statistical methods and international cooperation

Finland has played an active role in the development of statistical methods in environment statistics at both the national and the international level. An example of methodological work at the national level is provided by the development of a framework for environment statistics. Finland is one of the few countries in the world to have carried out an comprehensive opinion poll on environmental matters. Finland also participates with international organizations in the development of environment statistics, in particular with the OECD, the ECE, the CMEA (Council of Mutual Economic Assistance) and the Nordic Council. Additionally, methodological problems are considered by a Working Group on Environment Statistics set up by the Central Statistical Offices of Finland, Hungary and Sweden.

11 ENVIRONMENTAL EDUCATION AND DISSEMINATION OF INFORMATION

11.1 Environmental education

In 1986, the Ministry of education, the Ministry of the Environment, the National Board of General Education and the National Board of Vocational Education jointly started a project for developing environmental education in comprehensive schools, secondary schools and vocational training institutions. The project was intended to integrate environmental education into the teaching of other school subjects.

The main responsibility for developing environmental education in schools rests with the National Board of General Education and the National Board of Vocational Education. For the Ministry of the Environment, the most important task related to educational planning is to see and evaluate in advance what consequences changes in the society and in working life will have with regard to the environment, and to inform the education authorities of the requirements that these changes will put on education.

Comprehensive and secondary schools

According to legislation, education and other activities in comprehensive and secondary schools should be arranged so as to give the pupils such knowledge and skills as are necessary to protect the environment and nature. This should be part of the teaching of various subjects.

In October 1987 the National Board of General Education set up a working group for clarifying what environmental knowledge the citizens should have, how this knowledge should be given them in connection with instruction in various subjects for different age groups, and how teaching methods could be developed.

Vocational training institutions

In vocational training institutions, environmental education forms part of the arts end environmental education syllabus. This covers 38 hours per year and is common to all students in the general periods of all types of vocational education.

Moreover, environmental education is integrated into the teaching of specific general and professional subjects. The National Board of Vocational Education established the curriculum in 1983; from August 1987, environmental education integrated into other subjects will by law be compulsory in all vocational training institutions.

Text books and accessory material

It has been found necessary, while developing environmental education, to improve available text books and accessory material, both insofar as the factual information is concerned and particularly with regard to more varied teaching methods, as required in environmental education. The National Board of General Education, the National Board of Vocational Education and the Ministry of the Environment are expected to take action in this matter.

Teacher training

In teacher training there has been no integrated approach to environmental education, and in actual practice the situation is unsatisfactory. The Ministry of Education have been invited to include environmental education studies into the curricula for all teacher trainees for comprehensive school, secondary school, and vocational training institutions.

Supplementary training for teachers

The National Board of General Education is engaged in planning an environmental education programme for the years 1988 and 1989. They also arrange supplementary training for educators from localities all over the country. Environmental education is also taught at the provincial level to school headmasters and educators. The National Board of General Education recommends that environmental education be included in supplementary training for teachers locally, and cooperates with universities order to have environmental education included in the supplementary courses they arrange for teachers on the basis of collective bargaining agreements.

Supplementary training in environmental education for teachers in certain vocational training fields has already begun.

Universities and high schools

Experts on the general aspects of environmental education are trained at Helsinki University, Department of Agriculture and Forestry, at Kuopio University, Department of Natural Sciences, and at Jyväskylä University, Departments of Mathematics and Natural Sciences. Several kinds of study in natural sciences, agriculture and forestry, and technical sciences offer the possibility of specializing in environmental subjects. The biology programme at Kuopio University, for instance, centers on the planning of environmental hygiene, at Åbo Akademi the focus is on environment toxicology and maintenance of the environment. Studies in agriculture and forestry may include land use economy, which touches on economic problems connected with environment protection and so-called ecological land use.

Veterinary training includes education in environmental matters, which is, in fact, one area of specialization.

Other supplementary education

Open university level education

Since 1980, the University of Turku has offered an open university course in environmental protection for the lowest academic marks (approbatur). This consists of a basic course of 78 lessons and a one-week field training period. Subjects taught include ecology, natural resources, social sciences, and legal science. Certain other universities offer similar open university degree courses.

Education to promote employment

During the last few years, courses have been offered in waste management, air protection, the administration of environmental protection, and environmental protection, to promote employment amongst academic staff who are unemployed or threatened by unemployment. The courses consist of a three months' theory period and four months of practice on the job. (They have proved to be sufficiently thorough to give added qualifications to the participants, who have generally found employment quite easily in new jobs within environmental protection in the administration as well as in industry).

The universities' centres for supplementary education

The Finnish universities have altogether 14 centres for supplementary education. Courses of more than one week's duration have been arranged in environmental administration (for geologists, decision-makers etc.), environmental law, and matters related to threatened flora and fauna species. The University of Oulu centre for supplementary education is planning a study programme for environmental specialists to be started in the beginning of 1988. The programme would cover 4 x 5 days and be intended for staff in environmental administration.

The centres for supplementary education also have numerous short courses touching on environmental subjects.

The Institute for Development of Occupational Skills

The Institute for Development of Occupational Skills is a vocational education centre supported by the main labour market organizations and the National Board of Vocational Education. The Institute has a specific programme for environmental techniques, covering supplementary vocational education and training for local authorities, planners, managing and servicing personnel and the like.

Other supplementary training

Short courses in various fields of environmental protection are offered by a number of other organizations and institutions.

Nordic Cooperation

For past decade there has been active Nordic cooperation on environmental education at various levels of education. In 1974-1980 the school-level project produced study material for comprehensive schools in all Nordic countries. As a result, Nordic biennials are held on environmental education at school. The first - Miljö 83 - was organized in Sweden, the second - Miljö 85 - in Norway and the third - Miljö 87 - in Finland. The fourth - Miljö 89 - will be held in Denmark.

11.2. Dissemination of environmental information

11.2.1 General

The total number of newspapers published in Finland is 100. About 60% of the total circulation is politically independent. People's political views and their choice of newspapers do not correspond, since about 70% of those who give their votes to the left-wing parties read only right-wing or independent newspapers and as few as 5% read only left-wing newspapers.

The number of local newspapers published in Finland is 164. They cover the whole country. There are also many free distribution papers, which are published mainly in the towns. These papers are financed exclusively by advertising revenues. Also, two evening papers are published in Finland.

The total number of weekly or other periodicals published in Finland is about 1100. This is about 80% of the total edition of papers. This number includes periodicals published by labour market organizations (about 300).

The freedom of the press in Finland is regulated by the Press Act. It is complemented by ethical norms which are not juridically binding, but reflect good journalistic principles. A special body, the Council for Mass Media, discusses and takes a stand on activities of the mass media that contradict accepted journalistic principles.

The national radio and TV broadcasting is a monopoly of the Finnish Broadcasting Company (YLE) which is under parliamentary control. The Commercial Television (MTV) is entitled to broadcast a limited number of programmes, but it, too, is controlled largely by the same broadcasting regulations that govern YLE's broadcasting.

A number of private local radio stations were established in 1986. They concentrate on topical issues within their reception districts and finance their broadcasting mostly by advertising revenues. Cable television is also becoming more popular, and Finland has geared itself to cable TV more rapidly than any other country in the world.

11.2.2 Environmental issues

Environmental issues have been a frequent subject of discussion in Finnish society in recent years. Much of the credit for this is due to the mass media, since they have given much publicity to environmental affairs.

The press in Finland plays a key role in the formation of the citizens' opinions and outlook on life because by international standards Finns are avid readers of newspapers and periodicals. Regardless of party-political commitments, newspapers have written a great deal about environmental issues, and local environmental matters are regularly covered in local newspapers. Most of the largest daily newspapers have reporters specialized in environmental protection, and some newspapers have special columns for environmental matters.

The reporting of environmental issues has, however, often been characterized by an increased craving for sensation, resulting from the sharpening of competition between the mass media. By reporting only less important details, the mass media have often neglected crucial questions in an effort to increase their readership. Consequently, long-term issues of great significance, including serious environmental threats at the international level, have tended to be neglected.

Non-governmental organizations in the field of environmental protection and nature conservation have formed a major source of environmental information. The national organizations for nature conservation have their own periodical publications ("Suomen Luonto" and "Finlands Natur"), which include summaries in English. They are involved in other large-scale publishing. A large part of the organizations' operation consists of serving and informing newspapers and periodicals as well as radio and TV. The organizations focusing on specific sectors of environmental protection also have their own publications. The various alternative movements also distribute some environmental information.

The increase in the popularity of environmental protection has led commercial interests to adopted its concepts and exploit the positive values of environmental protection (e.g. in their marketing). This has not necessarily been to the advantage of the cause.

In environmental administration, problems of mass communication have arisen because of shortcomings in the collection and organization of data but also in the information activities themselves. Systematic data collection and organization are still at an initial stage in several fields of environmental protection. Up to now the disorganized, random and often very specific knowledge has not been readily adaptable for the purposes of mass communication. More recently, however environmental administration has paid increasing attention to the creation and development of data systems and the information service, thereby also opening up new prospects for the development of mass communication.

In general terms the status and appreciation of information activities in the Finnish State administration are fairly low. This state of affairs is reflected in the resources available and other requirements of information work. The information given by the environmental administration often takes the form of pure reporting of individual administrative decisions; The perception of larger contexts and the analysis of backgrounds, causes and consequences have been rare. Hardly any information material intended specifically for citizens has been produced. The contents and form of information activities have been greatly determined by the needs of the authorities and the various interest groups of the administration.

Accordingly, administrative publications serve almost exclusively the authorities and experts. Publishing activities are improving however. In 1984, ten surveys and studies were published in the field of environmental protection and nature conservation, whereas the number of similar publications in 1986 was 33. The Environmental Protection and Nature Conservation Department at the Ministry of the Environment has its own series of publications. Copies of most of available to anyone interested. The central administrative board subordinate to the Ministry, i.e., the National Board of Waters and the Environment, also publishes its own

series of publications. The National Board of Forestry, the Office for National Parks, is responsible for the production of information material related to nature conservation areas.

In the beginning of 1987 the Ministry of the Environment started to publish a periodical of its own. The periodical called Ympäristön- ja luonnonsuojelu (Environmental Protection and Nature Conservation) comes out four times a year. It is mainly aimed at people working within the environmental administration but also other administrative bodies and some other target groups receive it free of charge. Everyone interested can subscribe the periodical, too. In addition to this information on environmental administration and affairs in regularly given through articles in the relevant periodicals and daily newspapers.

Finland participates as an observer in the work of the Information Centre for Nature Conservation of the Council of Europe and when possible, contributes to the activities of the Information Centre. There are also regular contacts between the Nordic information officials within the State administration.

All in all, there is a lot of environmental information available in Finland. In spite of this - and partly just because of this - it is undoubtedly difficult to get a general impression on how the state of the environment and environmental protection are developing.

VI NATURE CONSERVATION

12 RECREATIONAL USE OF THE NATURAL ENVIRONMENT

12.1 Outdoor recreation in Finland

Outdoor recreation has been assuming growing importance in recent years as urbanization proceeds and the occupational structure changes. Outdoor activities and exercise are essential to the maintenance of people's mental and physical reserves. As people's income increase and the amount of leisure time grows, outdoor recreation becomes more and more common. Outdoor recreation should therefore be considered as one of the motivations for nature conservation.

In 1979, the Ministry of the Interior conducted a study of outdoor recreational activities in Finland. This revealed that the most frequently practiced activities were walking, swimming, cycling and skiing. Gathering the bounty of nature - picking berries and mushrooms as well as fishing - were also very popular.

The areas available for outdoor recreation are large in Finland compared with those in many other countries. Population centres are relatively small. The overwhelmingly largest part of the country is agricultural or forest land and the traditional right of everybody to have access to the natural environment has created relatively extensive opportunities for people to move about or enjoy temporary sojourns in the countryside. The right of common access also applies to water areas, and in some respects even to fishing.

In population centres and their environs, which are the scene of the greatest part of everyday outdoor recreation, special recreation areas have been provided in addition to the agricultural, forest and other lands to which everybody has the right of access. National parks have also added to the range of recreational amenities that people can enjoy. Purpose-built hiking trails are of considerable importance, especially in the vicinity of population centres and tourist attractions. Holiday homes have become very common and they, too, play an important role in the recreational pursuits of the people who own and use them. There is also a nationwide network of camping sites serving the needs of those who wish to enjoy holidays in close proximity to nature.

12.2 Outdoor recreation under the right of common access

The right of common access (or "everyman's right", as it is called in Finland) means that all citizens are entitled to use the natural environment regardless of whose ownership or possession the area in question may be in. One needs neither the permission of the land owner nor to pay anything. However, this right must not be used in a manner that causes damage or nuisance.

Movement on foot, skis or by cycle as well as temporary sojourn is generally permitted in areas that are in a natural or comparable state. The right of temporary sojourn also includes sleeping outdoors, e.g. in a

tent. It is, however, prohibited to ignite a campfire or other open fire on land owned by others without compelling need. Access to farmyards and certain nature preserves as well as to tilled fields, tree plantations and other areas reserved for special uses is restricted when it can cause damage or nuisance. Everybody is also entitled to move about on water or ice. Water areas may also be used as temporary anchorages. By contrast, the right of common access does not permit the use of motorized vehicles on land owned by others. This is generally permitted on public roads only.

Non-protected flowers, forest berries and mushrooms may be picked where access is permitted. In some municipalities in the northernmost part of the country, however, the right to pick certain kinds of berries is restricted to residents.

The most common wild berries in Finland are the cowberry (lingonberry, Vaccinum vitis-idaea), the bilberry (Vaccinium myrtillus) and the cloudberry (Rubus chamaemorus). Also the use of arctic raspberry (Rubus arcticus), cranberry (Vaccinium oxycoccos, V. microcarpum), rowanberry (Sorbus aucuparia) and raspberry (Rubus idaeus) has become relatively common in households and food industry. Approximately a half of the forest area is covered by almost a solid brushwood of cowberry or bilberry. Cloudberry can as well be found in the whole country. Cranberry and arctic raspberry grow in the southern and central parts of the country.

Cowberry produces annually about 100 - 300 kilograms of berries per hectare. The total crop in the whole country is around 200 - 500 million kilograms per year. Bilberry produces 200 - 800 kilograms of berries per hectare under favourable conditions. The total crop in the whole country has been estimated at about 100 million kilograms per year, if the flowering is successful. The total crop of cloudberry is over 25 million kilograms in the best years. The annual crop of cranberry varies between 20 and 25 million kilograms. The annual crop picked each year is very variable, but in any case it is several million kilograms.

In addition to weather conditions such silvicultural measures as forest draining, clear felling, brush control, forest fertilization and ploughing the forest soil affect the development of wild berries and the annual crop. Forest roads have given access to wider areas of wild berries.

Around 200 species of edible mushrooms grow in Finland. About 100 of these are abundant and big enough to be of significance for households. There are 22 mushroom species classified as articles of trade and most of these grow all around Finland. The annual crop of edible mushrooms is estimated at 1,000 million kilograms. Most of these decay before they are picked.

The picking of mushrooms and berries is a hobby of many citizens in late summer and autumn. For commercial purposes mushrooms are picked by trained people. The data on the quantities of picked mushrooms are quite insufficient.

Furthermore even lichen, primarily reindeer moss (Cladonia stellaris) is collected in the Finnish forests. It is used e.g. in wreaths, flower arrangements, decorating shop windows as well as in scale models. The

main part of the lichen collected in Finland is exported, mostly to Central Europe. At its highest the annual lichen export has been 2,000 tonnes. Lichen is collected south of the areas of reindeer husbandry, particularly in the coastal area between Oulujoki and Kalajoki rivers where lichen is the principal source of income for many households. The regeneration of lichen vegetation is slow, taking about 20 - 30 years.

In public sea areas and Finland's fishing zone, all Finnish citizens are entitled to fish. Also citizens of the other Nordic countries may fish for their own domestic consumption or for recreation. All citizens also have the right to fish with rod and handline with natural bait in their own municipalities. Payment of a separate fee entitles one to fish with a rod with natural bait or through ice throughout one's fishing district, which is the same as the province in which one lives. Under-18s are not required to pay anything. About 1.3 million people are fishing for recreation in Finland, two-thirds of them men. Recreational fishing accounts for about a quarter of the total catch. The most important species caught are perch (Perca fluviatilis), pike (Esox lucius), roach (Rutilus rutilus) and bream (Abramis brama).

With certain exceptions, hunting is a right included in land ownership. There are over quarter of million hunters. The most important game species are moose (Alces alces), rabbit (Lepus timidus), mallard (Anas platyrhynchos) and black grouse (Lyryrus tetrix).

In those parts of the country where the great majority of the population live, the total area covered by the right of common access has been constantly shrinking. Because lake- and seashores are also the most valuable areas of all as sites for holiday residences, they are being excluded from public recreational use for lack of action on the part of the public authorities; the right of common access does not apply in the immediate vicinity of dwellings. In many places, extraction of mineral substances, the construction of power lines and other infrastructure, efficient silviculture and bog drainage have altered the natural environment to such an extent that its recreational value has been reduced. Water pollution, harnessing of water power and other construction in water bodies often has a similar effect. With the development of forest road networks, the last wilderness areas are in danger of disappearing.

Noise, air pollution and a dearth of areas in a natural state are lowering the recreational value of the environs of population centres. On the other hand, improved mobility, due to increased numbers of private cars and boats as well as development of the road network, has brought larger areas within reach for outdoor recreation.

Outdoor recreation also causes disturbances and nuisances. These include wear and tear of the environment, littering, disturbance to human residents and wildlife as well as to means of livelihood like reindeer husbandry and fishing. Such disturbances have been a problem particularly in Lapland and the south and south-west coastal areas with their offshore islands. Those parts of the country, where nature is exceptionally delicate and vulnerable, are under considerable pressure from tourism. Road transport and boating have brought these areas within reach of large numbers of people.

12.3 Recreation areas

In addition to the opportunities for outdoor recreation provided by the right of common access, there are also areas set aside specifically for recreational use. According to the 1973 report of the ad hoc Recreation Areas Committee, so-called requirement-based local and district recreation areas can be divided into three types: parks, which are within urban areas and serve everyday recreational requirements, outdoor amenities on the peripheries of population centres, and hiking areas, which are away from population centres and mainly serve weekend needs.

There are also "natural resources-based areas", which are mainly wilderness-type hiking areas suitable for longer holidays and often valuable from the viewpoint of nature conservation as well. Those include primeval forests, which are taken care of by the National Board of Forestry, state-owned hiking areas and some national parks as well as some other forest and archipelago areas used for agricultural and forestry purpose, but still in a relatively natural state.

Some fjell areas and forest wilderness areas have remained in a relatively natural condition in northern Finland and there are comparable areas in the archipelagoes off the south and south-west coasts. The northern wilderness areas and some parts of the archipelagoes should, according to draft legislation prepared by the Recreation Areas Committee, be kept in their present state by reconciling basic means of livelihood, recreational use and environmental protection, but without changing their proprietary conditions.

Playgrounds and similar amenities belonging to individual properties, landscaped courtyards, etc., are not included in the Committee's classification, but also play a very important role in recreation.

The preparation of regional plans covering environmental protection and recreation have improved the preconditions for creating recreation areas. Efforts have been made to apply the measurement principles proposed by the Central Organization of Regional Planning Associations and the Recreation Areas Committee. The latter body's proposal regarding the sizes of local and regional recreation areas is presented in table 34.

There is relatively little up-to-date and nationally comprehensive information on the total size and quality of recreation areas and on the extent to which they are used. A total of 2,210 sq. kilometres has been set aside for recreation areas in regional plans. This represents 0.72% of the land in the country and amounts to 465 sq. metres for every inhabitant.

However, this figure does not tell very much about the opportunities for outdoor recreation that actually exist. Nor does it indicate how those opportunities are divided between different areas and population groups. Furthermore, about 42% of the total reservation is in Lapland, in the extreme north of the country. In other respects, too, the ratio of reservations to targeted requirements varies considerably. In some parts of the country, the areas reserved are clearly too small. In particular, we know very little about the recreational amenities that exist close at hand in various municipalities.

Table 34. Characterization of local and regional recreation areas according to the ad hoc Recreation Areas Committee.

Area	Max distance from dwelling (time/distance)	Minimum reservation m^2/ resident	Minimum size (hectares)	National population base
Recreation park	5 min/1 km	40[1)]	10	2,500
Outdoor amenity area	20 min/10 km	80[2)]	100	12,500 - 25,000
Hiking area	90 min/100 km	125-250	500	20,000 - 40,000

1) per residents of urban areas
2) per residents of the municipality

Regional plans contain 3,714 sq. kilometres of agricultural and forest lands eminently suitable for recreational use. This represents about 1.2% of the national territory, but about two thirds of it is in Lapland. However, those reservations supplement the relatively small ones that have been made explicitly for recreational purposes.

Municipalities and the State have made decisions relating to recreational use in about half of the recreation areas reserved in regional plans or concerning the right to use the areas.

Of the total reserved area 56% is owned by the State and 27% is privately owned. Private land ownership is most common in the case of areas close to population centres (49%). A quarter of the reserved areas contain purpose-built trails or tracks. Recreational use is still slight in nearly half of all reserved areas. Over 70% of the recreation areas located close to population centres are used extensively or moderately.

According to an estimate produced by the Regional Planning Associations, purchasing recreational and multipurpose areas or acquiring the right to use them would cost about 2,000 million finnmarks, of which the Helsinki Regional Planning Association's contribution would be half. However, this estimate dates from the 1970s and thus does not reflect the present situation.

Recreation areas are supplemented by camping sites intended for tourists and hikers. Modest fees are charged for these and they can substantially reduce the detrimental environmental effects of unregulated camping and improve the services available to hikers as well as their safety. The 360 camping sites in Finland recorded a total of over 2 million overnight

stays in 1985. Permission must be obtained from the Provincial Office to maintain a camping site intended for tourists. Sites are graded into one-, two-, and three-star classes.

In addition to public camping sites there are also numerous other areas where camping is possible. Such are e.g. the recreation areas owned by the municipalities or civic organizations. The yearly amount of overnight stays on these areas is estimated at 2 million.

12.4 Recreational trails

Arranging the use of recreational and multipurpose areas usually presupposes the construction of tracks or trails. Depending on their location, standard and the natural conditions in their vicinity, these can be used to promote exercise, outdoor hobbies, recreational fishing, hiking or tourism. Providing infrastructure of this kind makes it possible to channel most outdoor activities in a manner that keeps harmful effects on the environment or other land use to a low level. These trails are also needed to facilitate outdoor activities and increase safety. They help to make recreation areas more accessible and link different areas to each other in larger totalities. Waterside camping sites, overnight accommodation facilities and temporary marinas form a network of boating routes in their own right.

The plan for the construction of a recreational trail may be approved by the Provincial Office. This approval gives the trail a certain status which helps to maintain the trail even if the ownership of the area changes. A great majority of the trails have, however, been created under agreements between municipalities and landowners and without the sanction of the provincial authorities. Guidelines for laying out trails have been drafted to aid municipalities. Since 1980, the State has been providing grants to support the construction of trails crossing municipal boundaries.

Linked with the implementation of the recreation area reservations in regional plans, an effort has been made in recent years to step up construction of recreational trails. The development of the recreational use of the archipelagoes and large inland waters presupposes a network of boat routes and marinas, some of which have already been created. In Lapland, the aim has been to confine snowmobiles to separate trails.

12.5 Holiday residences

About one fifth of the Finns' total holiday time is spent at "summer cottages" - and as much as half in the case of senior salaried employees. In Finland, as in Norway and Sweden, holiday residences of this kind are very popular and common compared with other countries.

There were about 180,000 holiday residences in Finland in 1970 and 280,000 in 1980. The present figure is estimated to be 330 000. The overwhelming majority of the holiday residences are on lake- or seashores. Thus, after agriculture and forestry, holiday residences are the most dominant form of land use in coastal and inland shoreline areas.

The estimated total length of Finland's coast and inland shorelines is about 180,000 kilometres. In competition for the limited space available, general outdoor recreation has lost out to holiday residences and most of the country's coast and inland shoreline is in private use. Some 8,000 new holiday residences are still being built each year, the overwhelming majority of them close to water. If this development is allowed to continue, free shoreline will become rare in most parts of the country. Even now, there is very little of it in those parts of Finland where the majority of the population lives. The detrimental effect of shoreline construction on general recreational use is most clearly evident in the archipelagoes and the southern parts of the country.

Table 35. Summer cottage owners by population group (1978).

	%
All 20 - 64-year-olds	24
Wage-earners	20
Salaried employees	29
- (senior)	38
Farmers	14
Entrepreneurs	46

Source: Finnish Living Conditions. Statistical Bulletin no. 74. Statistical Centre of Finland 1984.

Unlike the other Nordic countries, Finland has not enacted legislation that would enable shoreline construction to be effectively regulated. It is possible to stipulate a detailed shoreline plan as a precondition for dense holiday residence construction in order to enable this construction and other land use to be harmonized with the shoreline landscape. However, most shoreline construction has occurred without general land-use planning or detailed plans. Indeed, shoreline construction has become wasteful of the sites available and is an obstacle to the establishment of adequate free areas and public recreation areas in suitable places.

Aside from its exclusive effect on public recreation, holiday residences have also despoiled the landscape in many places. If appropriate arrangements are lacking, it also increases the diffuse pollution load on water bodies and eutrophies them.

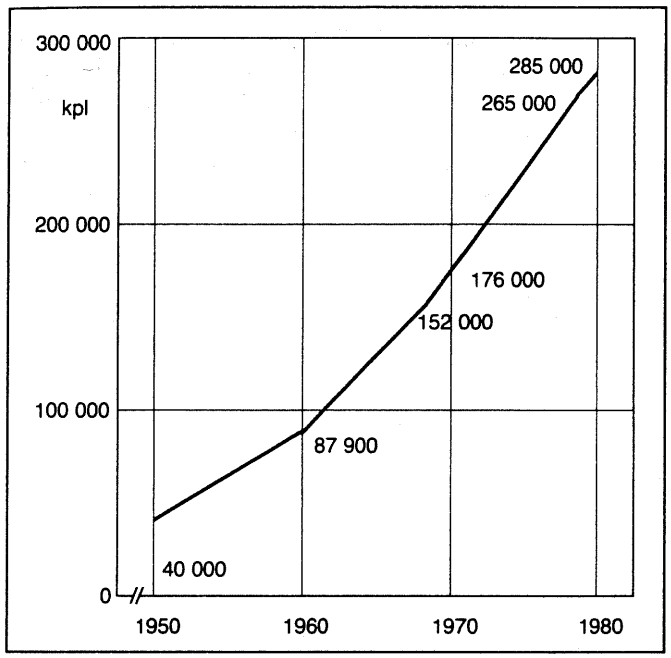

Figure 28. Number of holiday residences 1960 - 80.

12.6 Off-road traffic

There are about 35,000 snowmobiles in Finland, more than a third of them in the province of Lapland. The exact number is not known, because they are not registered. About 4,000 - 5,000 new ones are sold each year. Compared with snowmobiles, the number of other off-road vehicles is small. There are a few hundred tracked vehicles, most of them used for maintaining skiing slopes and the rest by the authorities. Three- and four-wheeled mopeds with large tyres and efficient weight distribution have recently appeared on the scene. They are mainly used on peat bogs, for example by cloudberry (Rubus chamaemorus) pickers. Several hundred of those vehicles, which damage the terrain in summer, are now in use.

Off-road traffic causes noise and all the other nuisances that passage through terrain involves. In southern Finland, in particular, motorcycle noise reduces the recreational value of the land surrounding population centres. It has been claimed that off-road traffic causes much harm to reindeer husbandry, including loss of calves due to miscarriage or the scattering of herds. In summer, various kinds of off-road vehicles damage the beds of lichen (reindeer mosses, Cladonia, Iceland moss, Cetraria islandica) on which reindeer feed.

Driving motorized vehicles in trackless terrain is not considered part of the right of common access and, under legislation enacted in 1977, requires the permission of the landowner unless they are being used on official duty, for fire fighting or rescue purposes, reindeer husbandry or professional fishing. People living in remote locations may drive across others' land to reach their dwellings.

The use of motorized vehicles is permitted on water. This applies both to motorboats and, in winter, to any motor vehicles driven on ice.

Provincial Offices can also restrict off-road traffic on land, water or ice in order to protect the environment, the recreational use of the environment, forms of livelihood based on use of the natural products and environment, or other public interest. Landowners in areas covered by such orders may neither permit others to drive motorized vehicles across their property nor do so themselves.

The legislation mentioned has not succeeded in completely eliminating the harmful environmental impact of off-road vehicles. Obtaining landowners' permission has proved awkward and red-tape-bound in practice, nor does the legislation stipulate any penalties for violating it. Especially in Lapland, where off-road travel in snowmobiles is becoming to be viewed as a traditional right, the law has been enforced very little. Most official bans on off-road travel have applied to the environs of population centres in southern Finland.

An ad hoc committee that has studied amendments to the legislation on off-road traffic has proposed the establishment of special snowmobile trails as a solution to the present problematic situation. According to the plan envisaged, about 1,100 kilometres of these trails would be needed in Lapland, some of them to meet the requirements of tourism.

12.7 Goals in relation to outdoor recreation

At a meeting of the Nordic Council of Ministers in 1983, the Nordic environment ministers discussed their joint policy with regard to outdoor recreation and approved, as their common goal, that all citizens of their countries should be guaranteed good opportunities for outdoor recreation in richly varying natural surroundings daily, at weekends and during their holidays, both in their own country and in the other Nordic countries.

In Finland, the Government submitted a Report on Environmental Protection to Parliament on 28 September, 1984. This included a statement that opportunities for outdoor recreation should be guaranteed all citizens and that the practical implementation of the right of common access should continue to be taken care of.

However, no legislation-based goals have been set for outdoor recreation in Finland. When the Outdoor Recreation Act was being passed in 1973, Parliament approved a rider requiring rights of common access to be retained in the established forms that they had acquired on the basis of the generally accepted custom of the country and various pieces of legislation. Furthermore, Parliament required the Government to ensure that community planning, construction and land use be arranged in such a way that opportunities for the recreational use of the environment be preserved and guaranteed. The ad hoc Recreation Areas Committee worked out proposals on the size and quality standards of recreation areas in its 1973 report. Confirmed regional plans concerning protected and recreation areas include long-term goals in relation to the creation of regional recreation areas throughout Finland.

Efforts are made to safeguard citizens' opportunities for outdoor recreation by ensuring the preservation of the right of common access,

making adequate and appropriate areas available, building up other outdoor recreational services and increasing opportunities for recreational fishing.

12.8 Legislation

Areas are mainly set aside for recreational purposes on the basis of physical planning in accordance with the Planning and Building Act. This piece of legislation requires that physical plans include an adequate amount of recreation areas, parks and similar public amenities. Laying out the areas included in plans is the responsibility of municipalities.

In population centres, recreation areas are reserved and acquired in conjunction with detailed plans, and outside them in conjunction with regional and master plans. The legal impacts of master-type planning are relatively slight from the viewpoint of land-use guidance and the procurement of areas for recreational purposes.

Legislation enacted in 1982 gives municipalities the right to intervene in real-estate transactions within their territories and to purchase the property in question if more than half of it is located in

- an area for which a confirmed detailed plan exists; or
- in an area which in a confirmed master plan is mainly earmarked for recreational purposes or as a protected area.

Amendments made to the Planning and Building Act and its explicatory decree in 1969 were intended to make the construction of holiday residences subject to similarly systematic planning. However, the new kind of plan - called a shore plan - introduced then mainly serves the interests of land-ownership, in addition to which it has succeeded in bringing only a part of all shoreline construction within the scope of guidance. In some localities, municipal building regulations have succeeded in limiting construction in shoreline zones.

The 1973 Outdoor Recreation Act also permits the construction of recreation trails on private land, thus making the use of private property more efficient. The Act also contains provisions dealing with camping sites and state-owned hiking areas, four of which have been created to date. However, none of them is situated in the southern part of the country, where the need is greatest.

There is little legislation on rights of common access. Criminal law forbids movement and even temporary sojourn on such farmyards or croplands, pastures and plantations that could suffer damage. The picking of wild berries and mushrooms is permitted anywhere that one is permitted to go. According to the Water Act, everybody has the right to traverse open water bodies without causing disturbance to anybody else, and may also sojourn there temporarily.

Legislation on fishing gives citizens certain common rights, including fishing in public water areas, and fishing with rod and natural bait in

their home municipality. Persons under 18 are allowed to fish with rod and natural bait as well as ice-fish anywhere in Finland.

There is both support for and opposition to more precise legislative regulation of rights of common access. The scope of these rights and, in particular, opportunities to avail of them have been continually narrowed. However, there is not sufficient unanimity on what contents they should be statutorily given.

Laws restricting the use of motorized off-road vehicles and motorboats are intended to prevent these causing a nuisance. The Waste Management Act contains a general ban on littering.

The Sports Act and its explicatory Decree is intended to develop municipal authorities' administration of sports and physical education and increase State support for this administration.

12.9 Administration

No uniform administrative system has yet been developed for outdoor recreation in Finland. At all three levels of administration (central, provincial and local), tasks connected with outdoor recreation are divided between several different authorities.

The State's particular task in this respect is to promote the recreational use of its own land holdings by establishing hiking areas and national parks as well as by providing other services. Promoting the all-round recreational use of waters is also primarily the task of the State. Furthermore, it is the State which gives municipalities the necessary guidelines for planning and establishing recreation areas and trails and provides them with grants to aid such projects. Matters within the purview of the Government and relating to outdoor recreation and environmental conservation are dealt with by the Ministry of the Environment, with the exception of recreational fishing, which is the responsibility of the Ministry of Agriculture and Forestry. The latter ministry is also responsible for hunting and for berry and mushroom picking. Overall direction and supervision of physical culture reside with the Ministry of Education. The Ministry of the Communications assists in the establishment and maintenance of marinas and promotes the construction of light traffic routes. Development of the recreational use of waters is the responsibility of the National Board of Waters and the Environment. The Finnish Tourist Board is subordinated to the Ministry of Trade and Industry.

Developing the recreational use of state-owned land and water areas is the responsibility of the National Board of Forestry, the Forest Research Institute and other authorities who manage the areas in question.

In many respects, the main responsibility for safeguarding citizens' opportunities for outdoor recreational pursuits has fallen on municipalities. They plan and implement recreation areas, trails, marinas and other outdoor services and promote recreational fishing. They also provide maintenance and services for recreation areas and facilities and collaborate with the relevant civic organizations in relation to the use of these amenities.

13 NATURE CONSERVATION

13.1 History of nature conservation in Finland

The origins of nature conservation in Finland are to be found in A. E. Nordenskiöld's[1)] speech of 1880, in which he proposed that national parks be established in order to protect hitherto untouched wild places. The first concrete programme for the establishment of nature reserves was published in 1910. It was prepared by the ad hoc Protection Forest Committee, whose main task was to investigate limitations to logging operations taking place at the northern timber line. The committee proposed the establishment of a number of nature reserves. A decision was reached on the first nature reserve, the Malla Strict Nature Reserve, in 1916.

A start was made on the preparation of a Nature Conservation Act in 1919, and the Act was promulgated on 1 July 1923. Together with other Nordic countries, Finland was one of the first countries in the world to introduce legislation in support of nature conservation. Initially a Government Counselor for Nature Conservation and his Bureau were responsible for nature conservation. These duties were transferred to the Ministry of Agriculture and Forestry in 1973 and from there to the newly established Ministry of the Environment in 1983.

13.2 Nature conservation objectives

Nature conservation objectives in Finland are not expressly defined in the Nature Conservation Act, but the duties of public nature conservation authorities are defined in the decrees. Since the early 1970s nature conservation programmes concerning certain types of natural areas, including forests, peatlands, ridges and eskers, have been drawn up. These programmes, as well as the Council of State Decisions in Principle connected with them, define the conservation objectives concerning the respective areas for a 10-20 year period. Once certain ongoing conservation programmes and investigations have been completed, the conservation objectives for the most important types of natural areas have been defined.

In its Report to Parliament on Environmental Protection in 1984 the Government defined the future tasks of nature conservation as follows:

> "The most important medium-term tasks in the next few years will be to complement the existing network of nature reserves, in particular by implementing protection programmes that have already been adopted. Further measures will include organizing the management, supervision and utilization of nature reserves, as well as research in this field, greater protection for

1) Nils Adolf Erik Nordenskiöld (1832-1901), Finnish-Swedish explorer, who in 1878 and 1879 navigated the Northeast passage.

endangered species of animals and plants and finally the development of legislation, especially a revision of the Nature Conservation Act. The latter work will include a strengthening of measures to protect natural landscapes and regulation of mining in nature reserves."

On the basis of the World Conservation Strategy, Finland in reviewing the measures that ought to be adopted for realizing the three leading principles mentioned in the above document in Finland, and a study has been prepared under the title of "The Ecological Objectives of the Management of Biotic Natural Resources".

Since the 1970s, nature conservation authorities have made several investigations into the needs of nature conservation. This matter is covered in section 13.6.

13.3 Nature conservation legislation

13.3.1 Nature Conservation Act

Nature conservation in Finland is based on the Nature Conservation Act of 1923. The Act makes provision for the establishment of different types of protected areas for the purpose of preserving virgin areas, the beauty of natural places, and animal and plant species. The Nature Conservation Act also contains clauses relating to the compensation required to be paid to private individuals and municipalities as a result of Government acquisition of property for conservation purposes, the protection of individual plant and animal species, and limitations to outdoor advertising.

Under the Nature Conservation Act a state-owned area which is to be preserved in an entirely natural condition may be designated a general protected area (a Strict Nature Reserve). For the preservation of an area of outstanding natural beauty, otherwise significant in itself, or for the conservation of a particular animal or plant species, a special conservation area may be designated on land owned by the Government.

If the area to be preserved exceeds 500 hectares in extent or is of great economic importance, provision for the protection of the area is made through an act; otherwise such areas are established under decrees. To date, six of the aforementioned special acts and eleven decrees have been promulgated. In addition an act has been proposed for the designation as conservation areas of certain peatlands on state-owned land.

The Government has the power to issue a compulsory purchase, i.e. expropriation, order in conjunction with the establishment of a conservation area, or to limit the use of the area by the land-owner. Recently no power which would limit solely the right to utilize the land has been provided for.

Under the terms of the Nature Conservation Act, nature reserves may also be established on land not owned by the State. This requires approval by the Provincial Office of an application made by the land-owner. The conservation order remains valid even when there is a change of ownership.

The order can be revoked either wholly or in part if the circumstances change, if conservation presents an obstacle to a project from which considerable general benefit is to be derived, or if an expropriation order has been prepared for the area and conservation is considered inappropriate for the purpose of expropriation.

Individual trees, groves and other natural formations can be preserved as Natural Monuments. The preservation of natural monuments started straight after the promulgation of the Nature Conservation Act. A separate Act was passed to prevent a hydroelectric power station from being built on the River Ounasjoki in Lapland.

Certain species of mammal, viz. the arctic fox (Alopex lagopus), hedgehog (Erinaceus europaeus), bats (Chiroptera, Vespertilionidae) and the flying squirrel (Pteromys volans), are protected under the Nature Conservation Act. The conservation of other groups of species is accomplished through special decrees, of which four have been promulgated to date. These refer to certain plants, bird species, reptiles and amphibians, and certain rare invertebrates. Furthermore, in 1982 an Act was passed concerning the protection of whales. It prohibits the use of Finnish vessels for whaling and also the import of whale products to Finland. Compensation can be paid for damage caused by protected animals.

The erection of billboards and the like for outdoor advertising purposes outside built-up areas is prohibited under the Nature Conservation Act. Although the latter acquired its present form in 1964, its wording was more or less the same as the Act of 1924. Applying this Act is difficult, however, because it does not define the concept of the built-up area.

The Nature Conservation Act is currently being thoroughly revised. Priority is being given to:

- re-definition of administration and duties as they apply to the Ministry, provinces and municipalities (the latter do not at present have Nature Conservation duties stipulated by law);
- the amendment of regulations concerning endangered species;
- the amendment of regulations concerning landscape preservation, particularly the addition of the concept of Landscape Conservation Area to the Nature Conservation Act.

13.3.2 Other nature conservation regulations

Game animals are provided for under hunting laws. Non-game birds and their nests and eggs are protected, with the exception of those species mentioned in the Nature Conservation Act which can if necessary be protected through Statutes.

Under the Fishing Act some species of fish are protected for part of the year or a minimum size of catch is specified.

The Land Resources Act of 1981 makes stipulations concerning the removal of pebbles, gravel, sand, clay and soil from surface deposits, but does not cover the removal of peat. Under with this Act soil may not be removed if this would detract from the beauty of a landscape, or destroy the scenic value of wild places or various types of natural formation. Sites from which such materials are to be removed must be located, and the removal of materials arranged, in such a way that the damage to the ecology and the landscape is minimal. Regulating the removal of surface deposits is the task of local authorities Removal of materials from ridges and eskers covered by the National Ridge and Esker Conservation Programme (see section 13.6) is at the discretion of the Provincial Office. The preservation of surface deposits is treated in greater detail in section 14.

Legislation on construction is important for landscape protection. It is treated in more detail in section 15.8.

13.4 Nature conservation management

The highest public nature conservation authority is the Ministry of the Environment, whose duties include improving nature conservation legislation and stipulations, and developing, planning and directing nature conservation objectives. National parks and nature reserves on state-owned land are managed by the National Board of Forestry and the Finnish Forest Research Institute, which are subordinated to the Ministry of Agriculture and Forestry. With the exception of the expenses from the staff, however, funds for the management of nature reserves are covered by the Ministry of the Environment's budget.

It is the task of the Provincial Offices to supervise the protection of privately owned land and to make the decisions regarding the protection of such land. The Provincial Offices are also responsible for supervision of outdoor advertising.

The autonomy of the Province of Åland extends to matters of nature conservation, and it has its own nature conservation legislation and administration. The publicly owned protected areas within the Province of Åland belong to the Provincial Government.

The Nature Conservation Act does not embody regulations covering municipal nature conservation duties. However, certain municipalities have been very active in this particular respect.

13.5 Protected areas

13.5.1 Types of protected areas

In Finland the areas currently protected under the Nature Conservation Act total 9,300 sq.km (Table 36). In addition, the National Board of Forestry has preserved 3,100 sq.km of Virgin Areas, Natural State Forests and Peatlands Safeguarded from Ditching.

Table 36. Types of conservation areas in Finland and their total size (on 1.1.1986).

	Number	Area sq.km)
1. National parks	22	6,693
2. Strict nature reserves	20	1,540
3. Peatland nature reserves	102	782
4. Other protected areas on state owned land	15	9
5. Protected areas established on privately owned land	647	499
Total	806	9,523
% of Finland's total area		2.8

1. National parks are intended as places in which Finnish wildlife and habitats can be viewed. They are established by law on state-owned land. The parks are preserved in as natural a condition as possible. Although efforts are being made to improve the public's opportunities for outdoor recreation. The decrees stipulate precisely what activities are forbidden and what are permitted in order to ensure that national parks retain their character and that the rights of local inhabitants are preserved.

Picking of berries and wild mushrooms, and temporary camping are permitted. Reindeer husbandry is also allowed under reindeer husbandry legislation in certain defined areas in northern Finland. Local inhabitants may have hunting and fishing rights. Fishing may also be permitted to visitors under the park regulations. Two national parks have tourist services (hotel, camping site and ski lift).

2. Strict nature reserves are intended expressly for research purposes and are for the most part closed to the general public. Certain reserves have nature trails that hikers are permitted to use. Most utilization and management objectives for strict nature reserves are prescribed in the Nature Conservation Act. Reindeer husbandry is permitted in all these reserves except the Malla Strict Nature Reserve. In some nature reserves in Lapland the local inhabitants have hunting and fishing rights.

3. Peatland nature reserves are areas set aside for the protection of peatland vegetation and animals for which the management and utilization objectives are also stipulated by a statute. Peat cutting, building and the felling of trees are all prohibited in such areas.

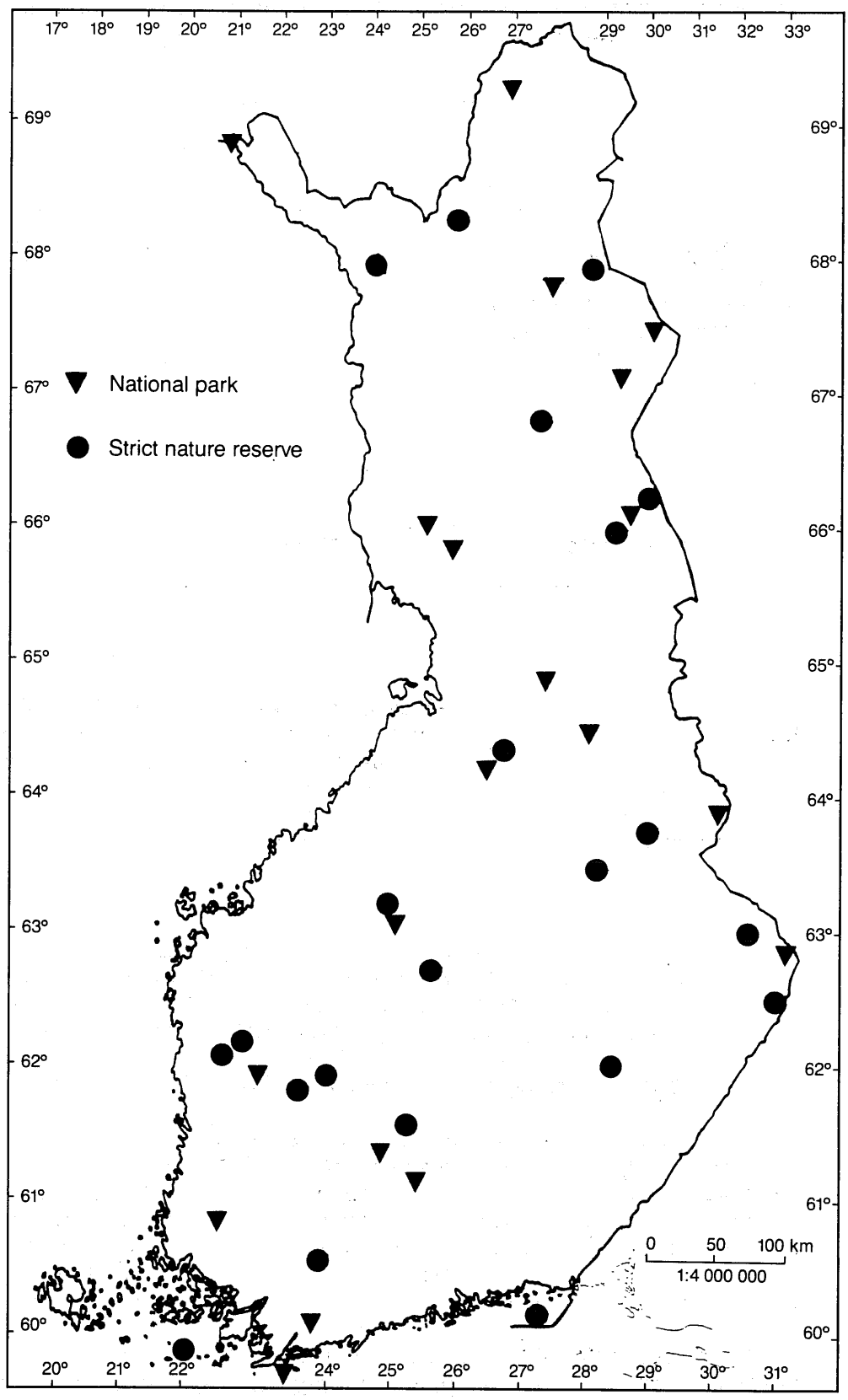

Figure 29. Location of national parks and strict nature reserves.

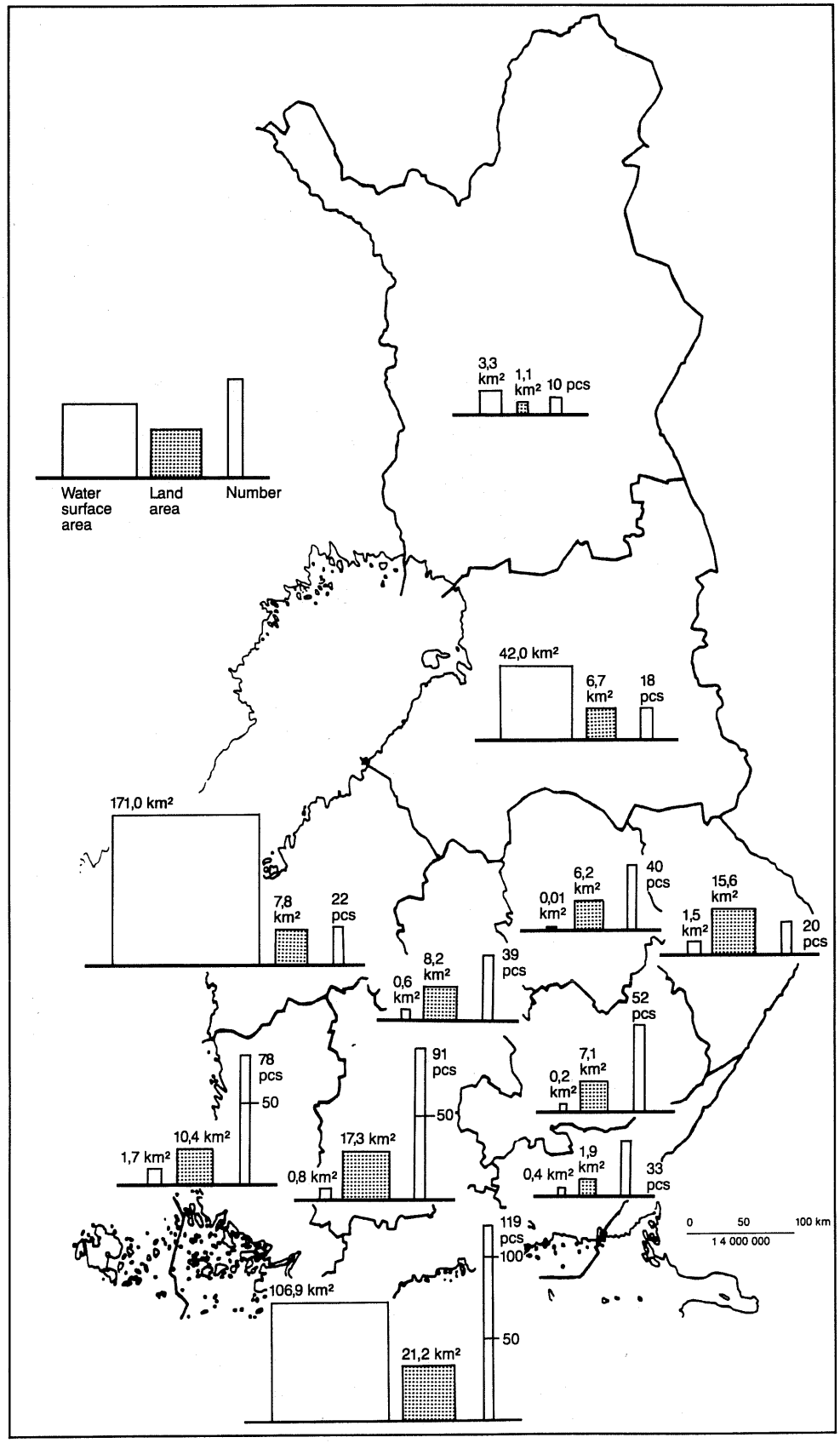

Figure 30. Nature reserves located on private land.

4. Other nature reserves on Government land may differ both in their nature and in the degree of protection accorded them.

5. Nature reserves Areas owned by private individuals, bodies, companies, or municipalities can come under protection by decision of the Provincial Office following an application by the land-owner(s). The nature of such areas, as well as the stipulations applying to their conservation, may differ radically. These nature reserves, particularly in the Archipelago, are important refuges for wildlife. Access to protected areas of the Archipelago is restricted during the bird nesting season. Rich forest sites, groves of rare trees, and peatlands have also been preserved on private property.

There are also some areas that are protected by decision of the public authorities, however, not on the basis of the Nature Conservation Act. A large proportion of the areas to which the Nature Conservation Act now applies were originally protected on the basis of an official decision. Primaeval forests form areas that are to be preserved in a virgin state. Nature management forests may include primaeval forests, parkland forests (requiring landscaping), and also sections to be managed as commercially productive forests. The third category comprises protected peatlands. These areas are listed in Table 37.

Table 37. Areas protected by decision of the National Board of Forestry and the Finnish Forest Research Institute on 1.1.1985.

	Number	Area (ha)
Primaeval forests		
Nat. Board of Forestry	178	37,122
Forest Research Institute	16	14,952
Nature management forests		
Nat. Board of Forestry	305	212,924
Forest Research Institute	7	277
Protected peatlands		
Nat. Board of Forestry	57	65,005

13.5.2 Utilization and management of nature reserves

Development of the management and utilization of national parks and other nature reserves is rapidly developing. In 1981 an Office for National Parks was established at the National Board of Forestry, although activities had already commenced in 1974. The resources employed for the management of these areas have greatly increased but so has the need for them because new sites have come under protection and the framework plans for management and use have been sanctioned.

The Nature Conservation Act and acts and statutes concerning the establishment of nature reserves define the main objectives of utilization and management. A master plan for the management and use of national parks is to be prepared. Such plans will also be drawn up for certain strict nature reserves, several nature peatland reserves and other special types of protected area. The plan defines the extent of the development and activities for each specific area and also the general use of the area. It also provides a basis on which to devise more detailed plans. As a basis for the master plan for national park and other protected areas, comprehensive investigations will be carried out on the geology, land forms, flora, fauna, history and ethnographic values, educational and research requirements, recreation utilization possibilities, and economic aspects.

The maximum management is required in the national parks. Virgin areas do not need any management, but attention should be paid to the upkeep and protection of landscapes molded by ancient settlements and the preservation of old buildings and structures occurring in them.

The use of national parks for sightseeing and educational purposes is to be promoted by opening information centres and special information posts explaining the natural history of the site, and by constructing nature trails and a network of hiking trails, with camping sites, cooking places and other facilities for hikers. The information centres in the main parks will have facilities for exhibitions. In northern Finland an important task is the construction and upkeep of wilderness cabins for the benefit of hikers.

A major objective in peatland nature reserve management is the control of forestry to ensure that the latter does not cause damage to the peatland ecosystem and scenery. Certain peatland nature reserves are also to be developed for interpretation and hiking purposes.

Table 38 shows the funds available for managing national parks and other nature reserves on state-owned land.

Table 38. Funds for managing national parks and other reserves in 1986.

	Thousend FIM
Management	3,700
Equipment purchases	530
House construction	4,550
Restoration	1,000

The increasing funds (Table 39) has made it possible to intensify the management of nature reserves in recent years.

Table 39. The amounts of money (finnmarks) used for the management of national parks and strict nature reserves.

Year	Management of national parks and strict nature reserves Thousend FIM
1969	55
1970	60
1971	60
1972	70
1973	100
1974	150
1975	216
1976	266
1977	320
1978	320
1979	420
1980	520
1981	900
1982	1,533
1983	2,128
1984	2,496
1985	2,800
1986	3,700
1987	5,500

13.6 Nature conservation planning and programmes

In the early stages of nature conservation planning (pre-1960) the main attention was paid to forest site types. In the selection of areas for conservation purposes, the regional variation in forest flora forest site types, subjects were mainly taken into account.

A survey conducted in 1980 indicates that the protected areas are representative of all the forest vegetational zones and site types on mineral soil. Grass herb rich forest types in particular, however, are very poorly represented. It has not been possible to carry out such comprehensive surveys on other types of habitats. Even the forest site type study is now out of date, as a considerable number of new sites on state-owned land have come under protection since 1980. The survey is currently being revised.

The principles and objectives of nature conservation planning have been studied in a Nordic project. Four reports have appeared in which a Nordic biogeographical division has been created, and the vegetation and geomorphological formations have been classified. The intention is to review at regular intervals the achievements, representativeness and development needs for nature conservation in all the Nordic countries.

The need to establish new nature reserves has been studied with respect to various types of habitats since the mid-1960s. Conservation programmes have been drawn up on the basis of inventories and dealt with by ad hoc Working Groups or committees representing various spheres of interest. Since 1970, ten programmes of this kind have been prepared two applying to national parks and strict nature reserves, two to peatland reserves, and the others to watercourses, wetlands, wild and scenic rivers, coastal and lake habitats, and eskers, and end moraines requiring special protection. Herb-rich forest conservation programme is under preparation and will be ready in 1988.

Council of State decisions-in-principle on the conservation programme represent a directive to nature conservation authorities. This directive also binds other Government officials in that it forbids them from taking any action which might hamper of the conservation programme. For other owners of land the decision-in-principle indicates a Government nature conservation requirement, and any action obstructing nature conservation objectives may lead to compulsory purchase unless an agreement can be reached on voluntary conservation or sale.

The Council of State has made the following decisions-in-principle concerning nature conservation areas:

- a short-term development programme (1978) for national parks and strict nature reserves and supplements;
- a basic programme concerning peatland conservation (1979 and 1981);
- a national wetland conservation programme (1982);
- a national esker and end moraine conservation programme (1984).

Wild and scenic rivers , parts of watercourses, and individual rapids are protected under the terms of a separate Act which prohibits the construction of new hydroelectric power stations in the areas stipulated by it.

Table 40 indicates the scope of the conservation programmes. In the near future conservation planning will concentrate on securing protection for habitats covering small areas. This will be a substantial big task. At the same time, however, research and inventorying in areas already enjoying protection will have to be intensified to allow conservation objectives to be refined even further. So far it has been possible to invest only limited resources in research and inventorying.

13.7 Implementation of nature conservation programmes

Nature conservation programmes are to be implemented in the following ways:

- by converting state owned areas into official nature reserves protecting them by acts or decrees;
- by acquiring privately owned land and converting these into nature reserves. Acquisition can be by outright purchase, exchange, or expropriation;
- by establishing nature reserves on private land, in which case the land owner will be compensated for loss of economic benefits;
- by carrying through the esker and end moraine protection programme on the basis of the Soil Material Act;
- by protection of waters through the Wild and Scenic Rivers Conservation Act which entered into force in 1987.

Table 40. Areas of sites covered by nature conservation programmes which have been approved in principle by the Council of State but not yet accorded protection by law (as of 1 November 1985).

	Surface Area (sq.km)
1. National parks and strict nature reserves	
Government land	627
Private land	88
2. Peatland reserves	
Government land	2,903
Private land	1,200
3. Wetlands	835
4. End moraines and eskers[1)]	960
Total	6,603
% of total area of Finland	2.0

1) Implementation based on the Soil Materials Act

New areas are acquired principally through voluntary sale. Acquisition by exchange is a practical procedure where land available for the transaction has been purchased with funds earmarked for nature conservation purposes. Expropriation is resorted to if the Government requires the land but the land-owner refuses to sell it. It is possible for the Provincial Office to serve an injunction prohibiting the land from being used for one year before the date on which it is to be expropriated.

Compensation payable for loss of benefit when a nature conservation area is established on private property is based on limitations imposed on land use incorporated in the Nature Conservation Act. This procedure is particularly useful when the area is not subject to full limitation, and the land-owner retains certain utilization rights.

13.8 Endangered plant and animal species

The Nordic Council of Ministers has arranged for the preparation of two reports on the endangered plant and animal species of Fennoscandia. Mammals, birds, reptiles, amphibians and vascular plants have been included in the surveys. In Finland the endangered species of Nordic wildlife amount to 34 animals and 28 vascular plants.

However, these Nordic studies have not removed the need for a composite study covering all groups of organisms. An ad hoc Committee was set up for this purpose in 1983 and their report was published in July 1986.

In this study the ad hoc Committee for the Conservation of Endangered Plants and Animals reviewed the entire Finnish flora and fauna with the exception of newcomers since the beginning of the century, and parasites of man and domestic animals. Conservation status was defined using the following international system of classification: extinct, endangered, vulnerable, threatened, and rare. The last category is split further into sub-divisions.

Some of the major criteria employed for assessing the status were specific abundance and distribution, population trends, and biological parametres. Endemic and internationally rare species were given special status for lack of established facts, the rarity of many invertebrates and phanerogam plants had to be assessed on the basis of biological knowledge of the species and the status of its habitat.

The Committee gained the impression that there are endangered species in practically all groups of organisms in Finland. Of the total flora and fauna (around 40,000 species) it has been possible to examine approximately 20,000 species, of which some 6% are believed to be endangered. The 1,011 endangered species listed by the Committee fall into the following categories: extinct 85, endangered 133, vulnerable 193, and threatened 590. These are divided between the various taxa as follows: vertebrates 68, vascular plants 184, mosses 111, algae 14, lichens 79, fungi 185, and invertebrates 370 species.

The oldest known reasons for animals becoming extinct in Finland as a result of human interference are hunting and persecution. Illegal persecution is still threatening a few species, but its significance as a factor

endangering species has markedly decreased. The majority of Finland's endangered species are now threatened by habitat changes.

Most endangered species (approximately 40% of the total) inhabit forest land. Many invertebrates and phanerogams have decreased as a result of reduced species diversity in forests. A second large group of endangered species (12% of the total) comprises organisms that have declined or become extinct owing to changes in agriculture. Construction is the main factor underlying the plight of a further 8% of the endangered species. Five per cent are endangered through changes in peatlands - principally ditching, and another 5% have been reduced through changes in aquatic habitats and water level regulation. Discharge of chemicals passing into the environment posses a threat to the survival of increasing number of species in Europe, and doubtless is liable to do so in Finland, too. The drastic decline of many raptors is due at least in part, to the poisoning of food chains. Population declines in lichens and other epiphytes are the result of air pollution and acid rain.

In its Report, the Committee for the Conservation of Endangered Plants and Animals proposed protection measures suited to each particular endangered species. The Committee also put forward the following proposals for measures to be adopted in association with their study, protection, monitoring, and the dissemination of information:

- The Ministry of the Environment should finance and coordinate research on endangered species;
- a specific conservation programme for each endangered and vulnerable species should be drawn up without delay under the direction of the Ministry of the Environment;
- a complete review of the Nature Conservation Act should be expedited. Especially urgent is a definition of endangered species, the preparation of a catalogue and conservation of which would be the responsibility of the Ministry of the Environment. Before the review is started, the regulations in the Act applying to the sentences which may be imposed for contravening it must be examined.
- current conservation programmes should be supplemented and the implementation of programmes expedited. The habitats of endangered species must be protected and managed even outside protected areas.
- a system for monitoring the status of endangered species should be established, and the official list of endangered species in Finland reviewed at five-year intervals. A computerized register of the country's endangered species must be established for that purpose.

13.9 Landscape protection and management [1)]

The development of landscape protection and management in Finland calls for a good deal of attention over the next few years. Sound progress has been made through voluntary arrangements, but the Ministry of the Environment must establish its objectives in the near future, especially with respect to the development of legislation and administration, and the use of economic control measures. Changes in the Finnish landscape indicate that it is not enough to realize landscape protection and management simply through directives and recommendations passed among various sectors, publicity and voluntary action on the part of citizens.

General objectives referring to landscape protection and management, especially in rural areas, have been considered in the reports of two ad hoc Committees. The most recent report contains the general objectives and the legislative and administrative proposals based on these for developing landscape protection and management.

From the standpoint of the entire spectrum of landscape protection and management tasks the most important legislation consists of the Planning and Building Act, Nature Conservation Act, the Land Resources Act, and forestry and water legislation. The updating of the Planning and Building Act to satisfy modern demands landscape protection and management is both vital and urgent.

Another fundamental component of landscape protection and management is the protection and management of landscapes molded by ancient forms of land use (traditional agriculture, fishing, reindeer husbandry, and early industry). Such landscapes are valuable in terms of environmental protection. Hence, it appears that the success of landscape protection and management depends on creating a planning and implementation system resembling the one required in conjunction with the tasks connected with the Nature Conservation Act.

The Nature Conservation Act, passed in 1923 makes provision for landscape conservation areas (see section 13.3.1). The original form of the Act had a section restricting outdoor advertising. Other stipulations applying to landscape conservation are not included in the Act.

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1) In Finnish terminology the term "landscape" means visual landscape rather than any concrete region or ecosystem.

VII SOIL, LAND-USE AND THE BUILT-UP ENVIRONMENT

14 PROTECTION OF BEDROCK AND SOIL

14.1 Utilization and protection of bedrock

In 1986 there were 11 ore mines in operation in Finland, along with 18 limestone quarries and 11 mines producing non-metallic minerals. A total of about 29 million tons of rock was excavated, of which nearly 24 million tons was ore or industrial stone. Stone was also quarried for use in manufacturing mineral wool or cement, as building material or to be crushed for ballast.

The area of greatest mineralization in Finland is a broad zone stretching roughly across the middle of the country. However, metal ore reserves are dwindling and this, coupled with a fall in prices, has caused a cutback in mining, especially of iron and copper. In the light of current forecasts, it appears that the quantities mined will continue to decline for some time. By contrast, the quantities of non-metallic minerals mined have been increasing rapidly in recent years.

The environmental impact of ore and other mines is slight in Finland as a whole. But local problems, such as scenic damage, dust, noise, effluent waters, polluted ground water and air, and slag heaps, are troublesome and a frequent cause of environmental controversies. In some areas, exploration and the exploitation of ore deposits conflict with environmental protection efforts, such as the establishment and management of nature reserves. Mining is regulated by the Mining Act and is not covered by the provisions of the Soil Resources Act, which applies mainly to gravel and sand extraction.

Stone crushing to produce a substitute for natural gravel has increased since the 1960s, especially in southern and western Finland. Most of these chips are used for road building. Stone crushing is regulated by the Soil Resources Act and a permit is required. Owing to the extent to which this activity has increased in recent years, the need to protect certain geological formations will be studied in the next few years.

14.2 Gravel and sand extraction and protection of eskers

Gravel and sand deposits cover a total of about 7,500 sq. kilometers, which is about 2.2% of Finland's total area. According to a survey conducted in 1971-78, there are about 47,500 million cu. meters of gravel and sand reserves above the groundwater table. Of this, 36,400 million cu. meters is sand, 10,000 million gravel and 1,100 million crushing material. The reserves are distributed unevenly throughout the country, the largest being the end moraines of the Salpausselkä that runs approximately east to west across the country.

Gravel and sand extraction is regulated by the Soil Resources Act, which came into force at the beginning of 1982. The purpose of the Act is to direct the extraction of soil materials to areas where it will cause the least disturbance and to ensure that operations are conducted in such a

way that deleterious effects on the environment are kept to a minimum. A system of permits has therefore been introduces. The extraction of materials other than those required for ordinary household needs requires the permission of the local Municipal Board. The Act stipulates that decisions on whether or not to grant permits must be taken on the basis of scenic and ecological considerations only. In certain cases, decisions concerning permits must be submitted to the Provincial Office for confirmation. The permit cannot be issued if the place in question is included in the national programme to protect eskers.

The 7,201 extraction permits issued under the Soil Resources Act and valid at the beginning of 1985 covered a total extraction quantity of 560 million cu. meters (including esker material and crushed rock) and an average annual extraction total of 70 million cu. meters. The total extraction area involved was 285 sq. kilometers. Annual consumption of stone material has totalled 35-40 million cu. meters in the whole country in recent years. Thus the permits valid at the beginning of 1985 covered more than ten years' average consumption.

The biggest problem associated with implementing the Soil Resources Act has applied to old gravel pits where the operators want to continue extraction. In those cases, municipalities have interpreted the provisions of the Act rather liberally.

Gravel extraction before the Act came into force has left numerous small, abandoned pits, many of which are completely untended. Land ownership conditions are the greatest cause of this, because in many cases, usually in conjunction with cultivation restrictions eskers have been divided equally between all owners of assessment units. As a consequence, gravel extraction has caused the destruction or despoliation of original esker landscapes in many areas.

A national programme has been prepared to protect esker landscapes. The programme includes 159 sites with a total area of 960 sq. kilometers, i.e. about 6% of all the eskers in Finland. It covers satisfactorily the need to protect glaciofluvial deposits, with the exception of those under water. By contrast, formations of other origin have been protected only more or less coincidentally as parts of areas protected for other reasons. There have been some tentative proposals regarding studies to ascertain how representative the existing network of protected areas is in the geological and geomorphological senses, but no practical steps have been taken.

The Water Act, which prohibits changes to or pollution of groundwater, also has a bearing on the extraction of soil materials. The National Board of Waters has made an inventory of important groundwater formations, a significant proportion of which are in esker areas.

Extraction and dredging of sand from the seabed are not covered by the provisions of the Soil Resources Act. These activities are regulated mainly by the Water Act's ban on changes to water resources as well as by legislation applying to public water areas and the State's ownership of land or right to use it. The Water Act leaves considerable scope for interpretation in assessing the preconditions for granting the right to extract sand from the seabed. Legislation concerning State ownership ofland requires a submission on the part of the Ministry of the Environ-

ment if the holding in question is important in terms of nature conservation.

According to a study commissioned by the National Board of Roads and Waterways in 1983, an estimated 22 million cu. meters of material was dredged along the coast of Finland in 1968-82, with gravel and sand representing a considerable proportion of this total. It is estimated that about 8 million cu. meters of sea sand will be excavated in the next few years. Exploration of seabed gravel and sand resources has begun and their exploitation is likely to be augmented.

The effects of marine sand and gravel extraction have been studied in a working group appointed by the Ministry of the Environment. Investigations were made before, during and after the extraction of 100,000 m^3 of sand in years 1983-1987. The effects of the extraction were studied in relation to geology, bottom topography, water and sediment quality, currents, turbidity, fisheries and bottom fauna. The results were published in the report of the working group. In its report the working group also made several proposals concerning e.g. the drafting of guidelines on the extraction of marine sand and gravel.

14.3 Peat cutting

According to an estimate made by the Geological Survey in 1980, there are about 5,000 sq. kilometers of bogs suitable for peat production in Finland. They contain about 5,200 million cu. meters of fuel peat. The Finnish peat industry developed rapidly in the 1970s, and by 1986 some 450 sq. kilometers were in production, yielding 20.4 million cu. meters of fuel peat (with an energy content of 19.5 TWh) and 1.3 million cu. meters of horticultural peat. Figure 31 shows the trend in fuel peat production and deliveries from 1972 to 1986.

A contributory factor in the rapid expansion of peat exploitation has been the rise price of imported fuels and a preferential policy towards indigenous energy resources. It is estimated that peat consumption will increase to 17-19 million cu. meters per year by the end of the current decade.

Large-scale peat cutting causes considerable changes in the balance of the natural economy. It means the destruction of bog ecosystems and often considerable impact on water bodies. Care of the landscape is just as necessary on cutaway bogs as in gravel pits.

There are no regulations generally covering peat cutting, but when the Soil Resources Act was being enacted Parliament called for the drafting of other legislation to regulate this activity. The ad hoc Peat Committee, which submitted its report in 1983, took the view that there was no need for such legislation, but that the production and consumption of peat could be adequately regulated by means of the Water Act, the Air Pollution Control Act, the Nature Conservation Act, the peatlands protection programme and the existing planning system. However, current regulations do not completely resolve the conflict between peat cutting and peatlands conservation, for which reason it has been proposed that peat cutting should be subjected to a system of permits in the same way as gravel extraction.

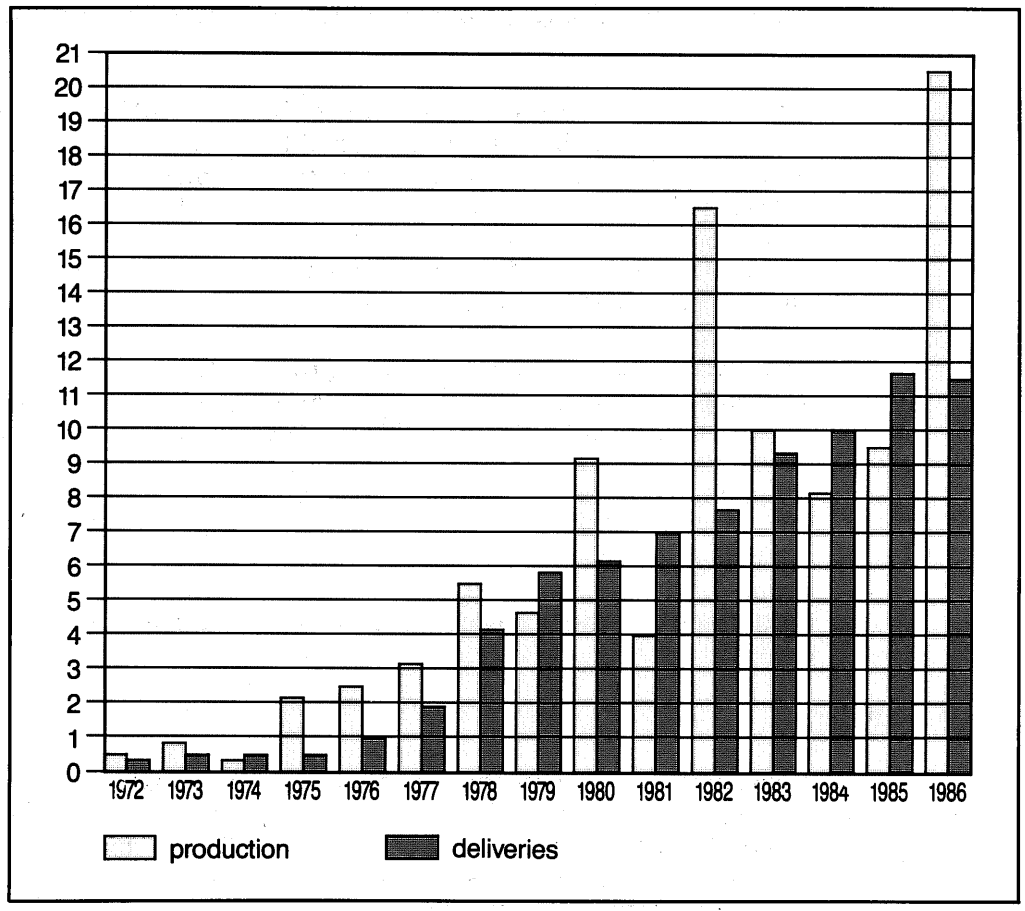


Figure 31. Fuel peat production and deliveries.

Source: The Association of the Peat Industry

In the late 1970s a working group on Energy and the Environment listed altogether 8,700 km^2 of peatlands and agreed that 700 km^2 of these could be used for peat cutting. The objective of the agreement was to promote the rational use of peat reserves and to avoid further conflicts in the matter. The agreement has been observed relatively well and the environment authorities have taken it into account e.g. when drafting the basic programme for peatland protection. Although the agreement covers only 8-9% of the total area of peatlands it has become a useful instrument for guiding peat cutting to areas less important for nature conservation.

15 LAND-USE PLANNING

15.1 General administration and legislation

The present legislation distinguishes between three forms of plan: the Regional Plan, the Master Plan and the detailed plan. All are juridically binding once they have been approved by the Municipal Council or the Council of a Regional Planning Association (formed by several municipalities) and confirmed by the Ministry of the Environment or, where detailed plans in rural municipalities or smallish towns are concerned, by the Provincial Office. No plan as such implies a right to build; for this, a Building Permit from the municipal Building Board is needed. Special Exemption Orders can be issued to allow deviations from the provisions of the Planning and Building Act and the regulations issued on its basis.

Guidance, supervision and development of communities' physical structure - land use and building - are regulated mainly by the 1958 Planning and Building Act and the pertinent Decree. This legislation is now being completely overhauled, which will take some time owing to political disagreements.

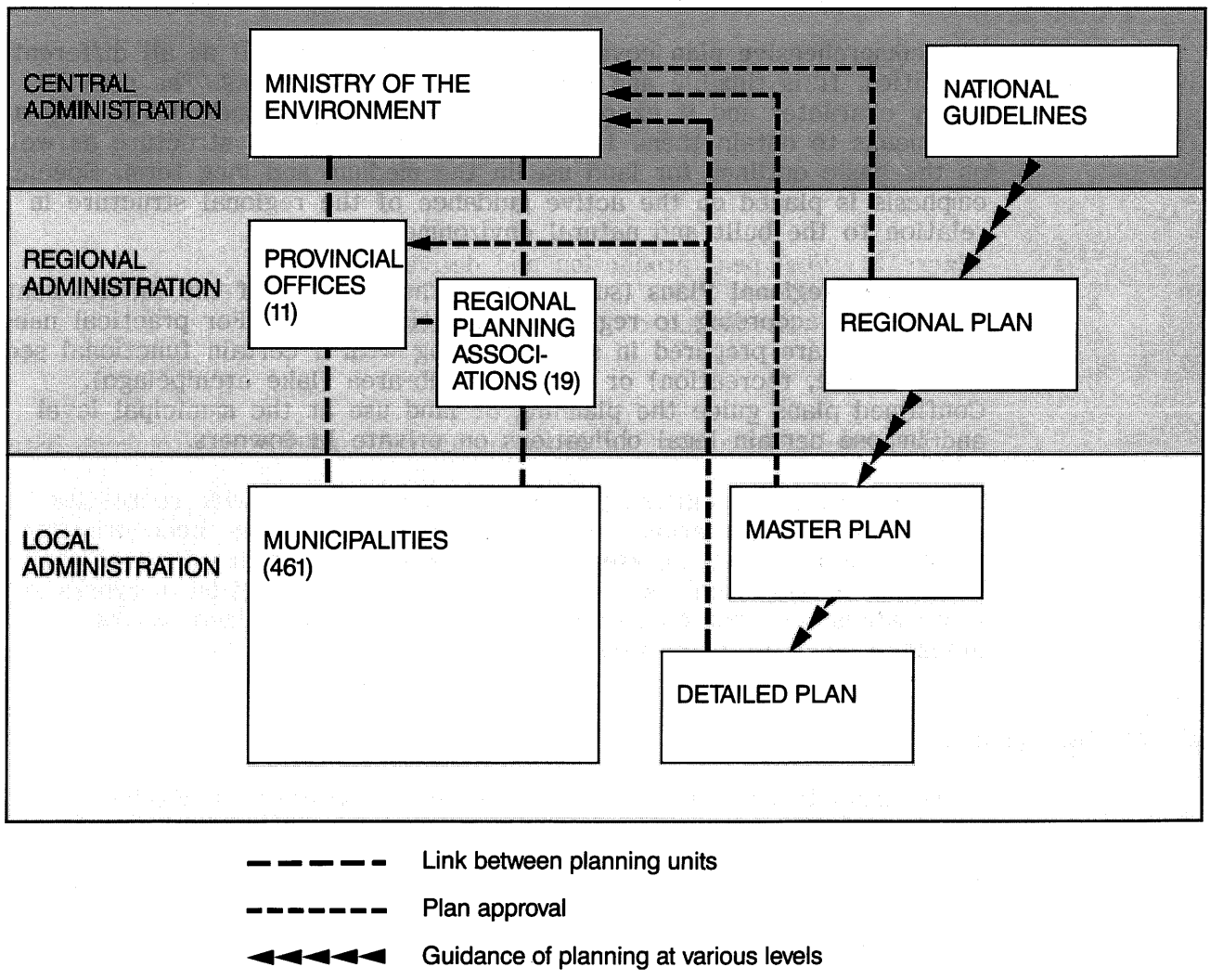


Figure 32. The physical planning structure.

National land-use planning is not at present directly covered by the Act, but the Ministry of the Environment has introduced measures to introduce planning of this type. It has been envisaged as coordinative planning which would provide bases and guidelines for regional planning as well as for integrating the land-use plans of various authorities' with each other.

15.2 Regional planning

Regional Planning Associations, set up by joint municipalities forming a rational economic and geographical unit, are responsible for drawing up Regional Plans. This is based on regulations and directives issued by the Ministry of the Environment. The Associations have no powers of implementation. A confirmed Regional Plan imposes certain legal obligations and serves as guidance for Master Plans and detailed plans, which should not differ substantially from the Regional Plan. The Regional Plan is realized primarily through confirmed Master and detailed Town and Building Plans.

In the present form, regional planning encompasses comprehensive plans and confirmed Regional Plans.

The comprehensive plan covers an entire region as well as all different activities. It is flexible and imposes no legal obligations. The plan has a policy character and it expresses the regional development objectives and the means to obtain them. It also depicts the regional structure as well as the basic outlines for land use in the medium and long term. Special emphasis is placed on the active guidance of the regional structure in relation to the built and natural environment.

Confirmed Regional Plans (submitted to the Ministry of the Environment) are drafted according to regional and national needs. For practical needs, these plans are prepared in stages dealing with a certain functional sector (for example, recreation) or a certain sub-area (lake archipelago). Confirmed plans guide the planning of land use at the municipal level and impose certain legal obligations on private landowners.

The first stage of regional planning has dealt mainly with recreational areas and the reservations for natural areas. Plans have been prepared for all regional planning areas. The Ministry has confirmed all of them. The second stage deals with built-up areas, communication networks and shore areas. The contents of these plans has been defined by the guidance needs of each area.

15.3 Master planning

Urban municipalities are charged with the preparation of Master Plans, which serve as a basis for detailed planning. The general use of areas for different purposes is indicated in this plan, which shows the principal features of municipal land use drafted for the whole municipality (Master Plan) or it can be prepared in stages for separate areas or activities (component Master Plan). Component plans have been drawn up for town centres, traffic networks, and recreational and shore areas.

The plan is approved by the Municipal Council and can be submitted to the Ministry of the Environment for confirmation. In 1986 21 Master Plans had been confirmed thus. They have been restrictive, mostly intended to safeguard public needs for recreational areas and have thus followed lines similar to the recreational and nature protection plans prepared by the Regional Planning Associations. In 1986 all urban and 88% of rural municipalities had Master Plans approved by their councils or were in the process of drafting them.

The master planning process includes the following stages:

- the Municipal Board initiates the preparation of the plan;
- consultations are held with Regional Planning Associations and neighbouring municipalities; necessary contacts are made with State and municipal authorities and private organizations while planning;
- an opportunity must be given to landowners to express their opinion before the content of the plan is approved by the Municipal Board or the municipal Planning Board (Committee);
- after the draft plan has been approved by the Municipal Board, it has to be displayed publicly and the authorities and organizations concerned have to be asked for statements. Statements of the Regional Planning Association, neighbouring municipalities and the municipal Building Board are statutory;
- approval is given by the Municipal Council;
- the plan can be submitted to the Ministry of the Environment for sanction; this attaches legal obligations to the plan and it has to be taken into account by State and municipal authorities.

15.4 Detailed plans

Detailed plans are specific and binding guides to building activities. They confer the right, but not the compulsion, to build.

Municipalities control land use through planning; in away they have a planning monopoly. The Municipal Council approves both the Town Plan and the Building Plan for rural centres. The Ministry of the Environment sanctions the Town Plan, and the Provincial Office the Building Plan for rural centres. Building that does not conform to these plans requires an amendment to the plan or a special Exemption Order. Confirmation must also be sought for any decision concerning an amendment of this kind, except when only a minor alteration to the plan is involved, in which case a municipality can be authorized to make the necessary alterations.

A gradual attempt has been made to transfer the Ministry's authority to confirm plans and grant Exemption Orders to the Provincial Offices and municipal authorities. As a result, there is a greater emphasis in the Ministry on tasks related to general guidance and development, such as legislative drafting, preparation of regulations and guidelines, and negotiating.

A detailed plan is needed as a basis for actual building. The plan gives the necessary regulations on building and the use of blocks as well as on the volume and location of buildings, their form and appearance and other details concerning land use on building sites.

Now that the Ministry of the Environment has delegated confirmation of plans to the lower levels, issuing guidelines and directions on detailed planning has become an important task in the Ministry. Central guidance is important in order to keep the land use planning practice and the content of the plans uniform and balanced throughout the country. The municipalities have supported this trend of centralized research and development work as a prerequisite for detailed planning, because it makes for savings of municipal resources, a consideration of some importance in municipalities where planning personnel and resources are scarce.

As part of the development work the Ministry of the Environment has issued a set of guidelines on the planning principles of the living environment to be applied in detailed planning. Such guidelines deal comprehensively with all the different functions and activities on a Town-Plan level, their area requirements, dimensioning principles and communication systems. They are intended to assist the municipal decision-makers when dealing with and approving land use plans. They can be regarded as a central government statement on the qualities of a good residential environment.

Land use planning takes place at local-government level according to the principles stated in the Planning and Building Act. In municipalities, the plans may be prepared by a voluntary Municipal Board, e.g. the Board for Technical Affairs or the Planning Board. In addition the Ministry of the Environment can issue guidelines and directives, which are then adopted at the local level, because the achievement of a good living environment demands a knowledge of local conditions.

15.5 Shore Plan

A Shore Plan is a typical detailed plan and corresponds thus in principle to a Town Plan or Building Plan. A Shore Plan differs, however, from other detailed plans in that the landowner himself is responsible for the drawing up and implementation of the plan (in other plans the responsibility rests with society). Society controls the use of land in shore areas in the following ways:

- the municipal Building Board (which is responsible for issuing Building Permits) or, in special cases, the Provincial Office considers whether a Shore Plan is needed;
- the planning instance and the planning area have to be submitted for approval to a State authority (Provincial Office);
- the plan shall be approved by the Municipal Council and ratified by a State authority (Provincial Office).

Society must, however, approve and confirm a Shore Plan when the plan is needed in establishing a so called sparse development. In other cases the plan can even be rejected. Problems have arisen in the application of the law since there is no unambiguous distinction between sparse and dense development; each case is considered on its own merits.

In its rules on the application of Shore Plan regulations the Ministry of the Environment has deemed that the establishing of holiday settlements without a Shore Plan is possible to some extent. The Ministry has stated in its guidelines on the matter that no more than one fourth of a kilometre long shoreline can be used for construction without need for a Shore Plan. It is also worth noting that at least one unbroken unbuilt part about 250 metres long has to be left on the line. This means that generally four or five holiday houses can be erected on a one kilometre long shoreline without a Shore Plan. In its rules the Ministry points out, however, that this amount can be reduced i.a. for landscape reasons.

15.6 Land-use planning and its relation to other sectoral planning

15.6.1 General

Land-use planning concerns the utilization of land and water areas for different purposes and the development of the environment. Since almost all activities require land areas, development planning taking place in different sectors directly affects land use. Many different requirements for utilization are often made of areas which are outstanding in terms of natural conditions or location. The task of planning the use of an area, in other words, the physical planning, is to resolve these different requirements.

Each decision to locate an activity deprives other activities of land area and affects not only adjacent regions but even more distant ones. In planning the use of an area an effort is made to integrate the land requirements of different activities and thus form an appropriate whole. The goals of the planning for the use of the areas which have a bearing on this whole involve either the structure of areas and communities or the land use, depending upon their degree of generality and content.

The goals involving the structure of areas and communities are connected primarily with the deciding how different activities requiring land should be located with respect to each other. The interactions and requirements for contact between activities have a vital influence on the goals set.

Whereas the location of activities is dealt with in rather general terms in planning concerning the structure of areas and communities, the decisions pertaining to land use are the result of much more detailed planning. An effort is made to reserve sufficient land and water areas for different activities, and their location is defined as precisely as possible.

The goals for land-use planning are influenced by the goals of economic and other societal planning. Likewise land-use planning involves an effort to integrate other sectoral planning with its own goals, and thus to reconcile the goals of different activities and plans.

The physical planning system in Finland is hierarchical, consisting of three levels. The law does not, however, require physical planning on the national level. A proposal submitted by the Ministry of the Environment for a new Planning and Building Act contains provisions for planning on the national level, but the lack of legislation has evidently impaired the prerequisites for nationwide physical planning.

The goal of physical planning on the regional level is, however, clear: to compile Regional Plans. During the planning work, which is long-term in nature and therefore done in phases, the development prospects and goals of the area being planned must be evaluated. Since the Regional Planning Associations have not succeeded in obtaining sufficient background information, an overall planning system, which has some features of an integrated operational planning system, has been created. One reason for the difficulties in obtaining background information has been the different time span of the planning. Physical planning covers longer periods than the planning of activities or economic planning. Therefore, long term operational studies have also been carried out as a basis for the reservations of areas. The need for operational studies in overall planning has diminished along with the development of regional planning.

On the other hand, the special nature of physical planning implies as, indeed, does any integrated planning that perspectives concerning specific fields of activity must be presented and taken into account as appropriate. Thus there is certain amount of overlap in all integrated planning.

One of the reasons for the problems in to the division of tasks between regional planning and other sectoral planning is the weak connection between the municipal level and the regional (district, provincial) administration of the State. For this reason the municipalities have usually attempted to present their own viewpoints concerning the overall need for developing the region through the action of inter-municipal federations, particularly Regional Planning Associations.

In the future, questions on the environment will carry greater weight in physical planning. The Regional Planning Associations serve as experts on issues pertaining to the environment in connection with land-use planning as well as, to some extent, with planning the development of regional policy.

In the integration of land-use planning with the planning of activities and economic planning, a particular deficiency is the lack of environmental impact assessment in these other plans.

15.6.2 Plans of different authorities influencing land use

In central administration the Ministry of Finance bears responsibility for the planning of economic resources. In addition to the budget, which is drawn up annually, a medium term operational and economic plan covering all sectors of State administration was introduced in the 1970s. This plan has helped the Ministry of Finance to plan its resources.

In central administration the planning of regional development policy basically means taking regional development policy goals into consideration in connection with other planning done by the authorities. The goals include furthering balanced regional demographic development, securing opportunities for obtaining permanent employment, raising the standard of living, improving the availability of important services, and ensuring a favourable living environment nationwide in a manner which does not favour the population of any particular region. The integration of planning the policies is the responsibility of the Ministry of the Interior, which draws up projections concerning population and employment opportunities on a provincial basis, and provides the Ministries and Provincial Offices with directions about how regional development policy goals should be taken into consideration in planning.

Planning with repercussions on land use is also carried out elsewhere within the central administration. Such planning refers to alterations to the environment and the development of the regional structure. These plans have been drawn up primarily in the administrative areas covered by the Ministry of Agriculture and Forestry, the Ministry of the Communications, and the Ministry of Trade and Industry.

The extraction of raw materials from the bedrock and soil, the use of waters and forest areas, energy management, roads, environmental protection, etc. are regional needs and forms of use regulated by special legislation. Planning may be based on a specific act, a statutory decree or solely on an administrative decision. The specific goals of planning, the procedure used in implementing it and the special expertise required mean that several different and separate planning systems have evolved.

There are clear points of contact but also of overlap between regional land-use planning and regional development policy planning, but co-operation has been insufficient. According to the Planning and Building Decree a representative of the Provincial Office must be invited to the meeting of the Regional Planning Association when matters concerning the drawing up of Regional Plans are dealt with. The decree stipulates that when a Regional Planning Association is carrying out its work it must, if necessary, be in contact with the relevant State and municipal authorities and associations representing the area included in the planning. The same principle applies to e.g. the planning of roads.

15.7 Consideration of the environmental impacts in physical planning

In connection with physical planning, investigations into the natural environment are usually little more than inventories providing information on the state of the environment. Impacts on alterations to the environment are examined only in connection with concrete projects and even then often only in terms of certain parts of the areas.

The Ministry of the Environment has on a nationwide basis investigated the most important plans and projects for location of activities. The progress of certain important plans has been followed together with the Regional Planning Associations and Provincial Offices and an effort has been made to influence planning so that aspects important to land use are taken into consideration.

In conjunction with regional planning much material is produced which may be used for such purposes as the planning the location of large industrial establishments.

When drawing-up of projects and specific plans the Regional Planning Associations work closely with the relevant public authorities and other bodies. Issuing statements is one form of this cooperation, the prerequisites for which are set down in law. The value of this cooperation is seen when Regional Plans are completed. By planning projects and giving statements the Regional Planning Associations aim at ensuring that the goals of their plans are realized.

Several requirements concerning the environment are stipulated by law for the detailed plans. They must be drawn up in such a manner that areas are built in an appropriate manner and so that requirements for health, fire safety, traffic, enjoyment and beauty are met. Cultural monuments and scenic and other aesthetic values must be protected and preserved where possible. In accordance with the model for the descriptions of detailed plans given by the Ministry of the Environment, the basic information on the area must include an inventory of the natural environment, the special characteristics of the area and areas to be protected, and the impact on the environment.

The best way to promote noise abatement and air pollution control through planning is to site the activities of a community so as to avoid adverse effects as far as possible. This is done mainly in master planning but to some extent in detailed planing. The means for noise abatement and air pollution control offered by the Public Health Act can also be utilized in physical planning.

The provisions in the detailed plans for pre-venting adverse effects on the environment may refer to the source of a disturbance, such as industry, or to an object which is to be protected, such as residential areas.

For detailed planning, proposal statements have to be obtained from the municipal Building Board, the Health and Fire Boards and, if necessary, from the Regional Planning Associations and neighbouring municipalities. With regard to Town Plans of particular significance, statements have to be obtained from all public authorities whose sphere of activity would be affected by the planning proposal. An effort is thus made to increase the level of expertise when evaluating the effects of the planning proposal.

There is often no connection between planning and the supervision of construction because the supervision is all too often restricted to checking that the construction accords with the plans. Supervision should, however, also take measures to ensure that construction is in harmony with the environment.

Application for an Exemption Order may sometimes take precedence since it is directly linked with the planning of the project, whereas in physical planning the location of activities and the issuing of provisions is frequently left on a rather general level. In connection with the Exemption Order procedure it is possible to request more precise documentation of the possible effects of the project on the environment.

15.8 Revising the Planning and Building Act

Revision of the Planning and Building Act has been underway since 1970. Several proposals have been made for revising the Act, but lack of political unanimity has prevented promulgation of a new Act.

The main goals of the revision include abolition of the landowner's right to scattered settlement, renewal of the regulations pertaining to compensation for expropriation, speeding up the planning system, and making it more efficient by shifting planning responsibility to the municipalities. The implementation of these goals present the main obstacle to unanimity in political decision-making. The revision has now been discussed for so long that there is a danger it no longer fully corresponds to more recent challenges.

Some of the goals of the revision have been implemented through special legislation. For example, a permit to take soil was made compulsory by enacting the Soil Resources Act. A permit is also required for the demolition of certain buildings.

One of the most difficult issues is regulating the construction of holiday homes so that sufficient shore area remains free for conservation and recreation purposes.

15.9 Land-use planning research and development

In recent years, the main focus of research and development related to land use planning involves: protecting and maintaining the built-up environment, taking account of the natural environment, testing how the physical planning procedures respond to the chancing needs of planning, studying factors which change local structures, developing suburban and sparsely populated areas, issuing instructions and other relevant material and putting urban economic research to use in the formulation of planning instructions.

In the long term, urban research and development will stress the reform and coordination of planning procedures, the form and content of different plans and other land use planning instruments like local regulations and building bylaws. It will also address some actual problems, e.g. the protection and planning of lakeside and seashore, and how health considerations can affect planning. The protection of buildings and the urban environment are constant objectives. The maintenance and renovation of suburbs where about a million Finns have their homes is fast becoming one of the most acute and many-sided questions of the immediate future.

16 PROTECTION OF BUILDINGS AND OF THE BUILT-UP ENVIRONMENT

16.1 Present situation

During the past quarter of a century the Finnish city has changed radically. The country has ninety-four towns, and about two thirds of their almost three million inhabitants live in buildings constructed after 1950. Not only modern residential buildings, but also new facilities for commerce, industry and transport give the urban environment its distinctive character.

Nevertheless many old buildings still survive, and about a sixth of all the residential structures date from before the war. However, the older buildings have usually only been preserved because more efficient construction has not yet bulldozed them aside. Only rarely is their preservation based on deliberate municipal planning, and thus in accordance with the town's explicit goals.

The older blocks have been under threat since the 1960s, and demolition of good, serviceable and valuable buildings has been widespread. This has been a consequence of the intensive structural change in society together with changes in values and the considerable financial resources available for the construction of new buildings. With the exception of farms, most buildings have been demolished to make way for bigger ones. It has to be said though that many of the old wooden buildings have reached such an age that "natural" turnover has also been considerable. The building of extensions in a style which contrasts with that of the original has impaired the cityscape. Breaches of style have also arisen as a consequence of alterations made to windows in the name of energy conservation.

The attitude towards old buildings has now begun to change. Housing policy based solely on the construction of new buildings, and thus entirely changing the community structure, has met with increasing opposition from both planners and the local population.

Efforts to preserve structures have been directed mainly at buildings and areas of architectural or cultural significance. The most active parties have been private citizens, local culture societies and museum authorities (the National Board of Antiquities and Historical Monuments, and the local museums), but some response has also come from the physical planning authorities and the municipalities.

In Finland has few buildings significance from the standpoint of the history of architecture. Hence during the past few decades a deliberate effort has been made to conserve buildings of recent origin, including areas which date from the 1920s and '30s.

16.2 Goals of building conservation

Building conservation can be looked at from many angles:

- securing the prerequisites for preserving built-up areas and making conscious efforts to remove factors posing a potential threat;
- furthering the care and repair of old buildings;
- preserving social and cultural communities and also specific local characteristics;
- actively linking new construction to the existing environment, and the use of supplementary construction to repair what has already been partly destroyed.

Basically, protection entails focusing attention on the preservation and development of prevailing conditions. Protection of buildings is thus an essential part of urban renewal. In an increasing number of municipalities its importance for improving the quality of the environment is now understood.

Repairs should be carried out with expertise, respecting the individual character of each building and adapting the work to the building's character. Standardized modernizations often ruin an old building, and should be used with care so as not to make an old building look like a new one.

The conservation of buildings is stimulated by historic and aesthetic values on the one hand and purely practical ones on the other. These should not be so difficult to combine.

In areas worth protecting every effort should be made to ensure that town planning be used to eliminate factors constituting a threat to the preservation of buildings and areas which can still be utilized or repaired. This is done primarily drawing up the Master Plan and the detailed plans in such a way that in areas worth preserving the protection of buildings is taken into consideration, promoted or even made compulsory. The condition of buildings in various areas should be documented and then evaluated from the standpoint of conservation. The protection and development of the area are approved in the detailed plan, and the supervision of construction will finally insure that the work is done out in accordance with laws and plan regulations. Restoration and basic renovation are important ways of protecting buildings on the municipal level.

All in all, the protection of buildings is an integral part of town planning and urban renewal. The municipalities play a key role in the protection of buildings, and should therefore take the preservation and renovation of buildings into consideration at the right time and in the correct manner when developing areas worth preserving.

16.3 Legislation concerning the protection of buildings

The preservation of buildings prescribed by two acts: the Planning and Building Act and the Building Protection Act. The new legislation concerning the protection of buildings came into force on July 1, 1985.

The revised legislation clarifies the application of regulations, emphasizes the importance of cooperation between authorities, arranges between municipalities and the State the division of costs involved in protection, and ensures that valuable buildings are not destroyed during the legal protecting process. The purpose of the renewal of the protection legislation is to acknowledge that preserving the architectural heritage is a part of normal planning and construction activity. The protection of buildings should no longer be an impulsive effort actively pursued at too late a date.

In physical planning it is possible to include preservation in a flexible manner together with other goals of land use. The responsibilities set out in legislation concerning the protection of buildings mean that the built-up environment and the values inherent in it will in practice be the basis of the physical planning. The Building Protection Act as a special act is applied primarily in areas which have not been physically planned, but it can also be applied in planned areas when the goal of protection cannot, for some reason, be attained by the general regulations of the Planning and Building Act.

The principal goals of legislation can be formulated as follows:

- the protection of buildings and the built-up environment must become a natural aspect which is always taken into consideration in all areas and on all levels of administration where decisions concerning the built-up environment are made. The protection of buildings must be based on adequate planning;

- as a consequence of changes in legislation the protection of buildings assumes a wider scope, encompassing the built-up area as a whole. In the protection of individual buildings, in new construction, as well as in repair and renovation the architectural heritage and the preservation of a good environment are to be ensured in a more efficient manner than has hitherto been the case;

- the protection of buildings is to be carried out primarily through measures taken by the municipalities. Legislation does, however, provide the Council of State with the possibility of intervening. It is necessary to make use of this possibility if the measures taken by the municipality are insufficient;

- the buildings for which it is not possible to find a practical use constitute a problem which not even financial support can resolve. The municipalities should make efforts to find an appropriate use for buildings;

- the conflicts arising out of the protection of buildings should be resolved openly between the parties involved. The responsibility of the public authorities and the legislation which is to be applied should,

in each case, be determined as quickly as possible. The decisions concerning the preservation or demolition of buildings are important, particularly for those individuals whose dwelling, employment or other condition are affected by these decisions. A sufficient amount of publicity, an active information policy, and attention to the view of the citizens when interfering with the built-up environment are parts of good administration;

- the consequences of and penalties for operations which either lack a permit or are illegal are becoming more severe. The administration must, efficiently and using the various means available to it, ensure that illegal measures do not make the protection of the built-up environment either more difficult or hinder it completely.

VIII RESOURCE MANAGEMENT AND POLLUTION CONTROL

17 WATER MANAGEMENT

17.1 Use of water resources

17.1.1 General

Water bodies have played an important role in the development of Finnish society. In particular, water-borne transport, the use of water power and fishing are founded on old traditions. The way in which community structures have developed is one manifestation of this: the population is largely concentrated in strips along river valleys, especially in the coastal regions. The largest towns and cities have grown up at river mouths. Industrial settlements developed beside rapids or close to waterways.

The utilization of water bodies has meant quite extensive construction and regulation, especially in this century. This work was at its most intensive during the post-war reconstruction period in the 1940s and 1950s.

Hydro power played a central role in the national electricity supply until the 1970s and nearly all of the major watercourses were harnessed. Several hundred hydroelectricity power stations were built. To facilitate log-floating, dredging was carried out on an extensive scale until the 1950s, when loose log-floating was discontinued on most watercourses. Since the 19th century, as part of efforts to make agricultural and forestry methods more efficient, water levels have been lowered in numerous lakes, rivers and streams dredged and bogs and other water-logged areas drained. Regulated lakes represent about one third of the total lake area in Finland. They are regulated mainly to optimize hydroelectric power generation but also to control floods.

Public attitudes to water-related values are gradually changing. Today, the quality of the water environment, its amenity value and the preservation of particular natural features are often considered more important than economic aspects. This change of attitude began to become perceptible in the 1960s. In recent years, changing values have made themselves noticed in the form of a wide-ranging public discussion and even civic action in response to some individual projects.

Public policy on water resources has also been influenced by technical and economic development. Electricity generation is no longer solely dependent on hydro power. Indeed, the Government has stated in its energy policy programme that, taking into account the economic aspects, environmental impacts and other factors associated with harnessing watercourses, it is improbable that hydroelectric capacity will be further expanded to any significant extent. Log-floating is economic only on the largest water courses, which means that several hundred disused floating channels can be rehabilitated for other use. The long winter severely limits possibilities of developing transport on inland water bodies.

Awareness on water pollution grew in the 1960s and since then anti-pollution measures have been one of the areas of main emphasis in

water management policy. In addition, more and more attention is being given to active rehabilitative measures. These include rebuilding fish stocks, restoring scenic values, making living environments more attractive and improving recreational amenities.

In water management the attention has inevitably been on inland waters rather than on the sea. This is understandable since the Finnish lakes are susceptible to pollution and many of the greatest polluters are located by the inland watercourses. Nevertheless, the status of inland waters and marine areas is equal in relation to the water legislation and thus all water pollution control measures are also applicable to the national sea areas.

Despite the abundance of water resources in Finland, there are significant problems involved in supplying population centres with water.

17.1.2 Water supply and irrigation

In 1986 4.0 million people or about 81% of the total population are supplied by waterworks serving 200 or more people. These waterworks use a total of 13.2 cu. metres of water per second, of which 6.7 cu. metres is surface water and 6.5 cu. metres ground water. Per capita water consumption is 288 litres per day. Consumption has been declining steadily since 1972, when it was 335 litres. The quality of the raw water is generally quite good, but some population centres are still using poor-quality surface water.

Ground water has increased its share of the total water supply by about 11 percentage units in the past ten years. It now accounts for 49% of the amount used by the waterworks mentioned in the previous paragraph. Ground water is also widely used in areas of diffuse population. Its growing popularity is attributable to its good quality and dependable availability.

In 1980, the UN General Assembly declared the eighties the international decade of water management. The national goals set by Finland in this connection include those of studying and improving the quality of supply water and promoting water supply schemes in areas of scattered population. The aim is that by 1995 all settlements inhabited all the year round will have the possibility of having appropriate running water and sewerage amenities. That would presuppose providing services for about new 50,000 inhabitants of sparsely-populated districts every year from now until then.

Irrigation has been spreading quite rapidly, mainly in the southernmost and South-Western parts of the country. Nevertheless the average total area irrigated each year remains rather small. Some 100,000 hectares, about 4% of the total arable area, are irrigated in dry years. Shortage of water is an obstacle to increasing the scope of irrigation in coastal areas.

The pulp and paper industry used a total of 1,100 million cu. metres of water in its processes and for purposes other than cooling in 1982. The total had been 1,900 million cu. metres in 1970, when it began a steady decline. Other industries use 140 million cu. metres a year. Industry uses

3,900 million cu. metres of seawater and 690 million cu. metres of freshwater a year for cooling. Fish farming used about 1,700 million cu. metres in 1982 and this total has been growing at a high annual rate being today over 3,000 million cu. metres.

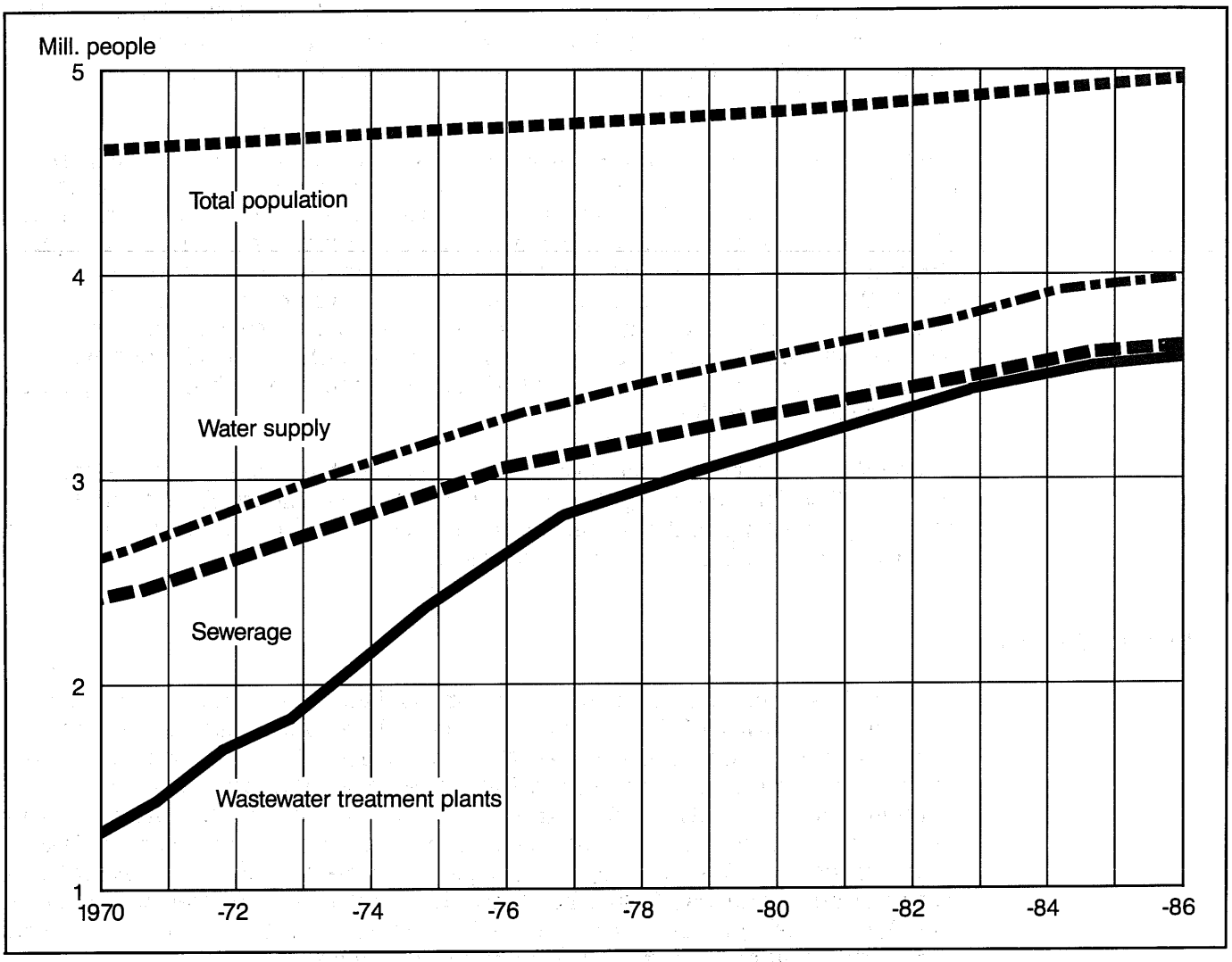


Figure 33. Population served by public water works, sewer systems and waste water treatment plants.

17.1.3 Recreational use

Finland's water bodies provide excellent natural amenities for recreation. They are mostly in private ownership, but the Water Act permits their common use for swimming, boating and some other small private use. The owner's permission is usually required for fishing (see chapter 12). Under traditional and statutory rights of common access to the natural environment, coast- and shorelines can be used for recreational purposes.

Navigation channels built to serve the needs of water-borne transport are also very suitable for recreational uses and tourist traffic. There are 6,100 kilometres of these channels in inland waterways and 6,500 in coastal waters. Boating is also possible away from marked channels on

river and lake routes still in natural or near-natural condition as well as in the Baltic archipelagoes. The number of boats used for recreational purposes in Finland is slightly more than 600,000, including 300,000 rowing boats, 250,000 motorboats, 25,000 canoes and 18,000 sailing boats.

There are between 2,500 and 3,000 bathing beaches intended for public use. The water quality at those close to population centres does not always meet the higher standards required for swimming, but is rarely so poor as to constitute a health hazard.

Since Finland has a great abundance of water bodies relative to population, it has been possible to build a large proportion of the country's holiday residences on lake shorelines or the coast. There are now about 300,000 holiday homes and their number has grown by about 3% a year. Growth in their number has slowed down perceptibly in the South and South-West owing to the non-availability of suitable waterside sites. Growth in their number is now shifting more and more to the central, eastern and northern regions. In many places, holiday residences have become an obstacle to the use of shorelines and water bodies as public recreational amenities.

Finland's water bodies are important from the viewpoint of developing tourism. Tourist centres generally offer their customers facilities for swimming, boating and fishing. Passenger boat services are also important on the largest lakes and water systems.

17.1.4 Fisheries

Finland has good natural conditions for fishing. The country's location between two arms of the Baltic, long coastline and extensive inland water systems provide a good starting point for fisheries, but possibilities have been limited by low productivity due to a relative scarcity of nutrients in the Baltic and in the inland watercourses, the short growing season for fish and the humus content of the water. The average lake catch is usually 5 - 10 kilogrammes per hectare and year. In exceptional circumstances the catch has been as high as 40 kilogrammes per hectare. The lakes' fish productivity is 10 - 80 kilogrammes per hectare and year, the average value being 20 kilogrammes per hectare.

The fisheries value of watercourses has been reduced by water pollution and large-scale harnessing and regulation. Harnessing and regulation for power generation, log-floating and flood control reached their highest level between the 1940s and 1960s. Dams have particularly reduced the access of migratory fish to their reproduction areas. Eighteen rivers that discharge into the Baltic used to have natural salmon stocks, but now only two of them, the rivers Tornio and Simo, still have naturally-reproducing salmon.

In recent years, work has begun to rehabilitate water bodies and restore their fish stocks. They are being stocked with large numbers of fish in an effort to compensate for the damage that they have suffered. More than a million salmon and 800,000 sea trout fry were released into Finnish coastal waters in 1983. The State has established 11 fish-breeding centres and three more are being built.

The number of professional fishermen is steadily declining and there are now fewer than 2,000 full-time fishermen in the whole country. Slightly over 80% of them fish in the Baltic. By contrast, the number of people who fish for recreation or to supply their own household needs has been growing. Nearly one in four Finns fishes for recreation. Fishing to supply household requirements is important in sparsely-populated rural districts as well as on Baltic islands and along the coast.

Fish breeding is discussed in sub-chapter 3.7.

17.1.5 Use of water resources for power generation

At the beginning of the 1960s, about 80% of Finland's electricity requirements were supplied by hydroelectric power stations. The proportion was still nearly 50% a decade later, but is now only about 30%. Although hydro power's relative share of the total electricity supply has declined, its importance in regulating output and as an auxiliary source remains, because it can be quickly and flexibly adjusted to match fluctuations in demand. The facts that hydro power is indigenous and constantly renewable, involves low operating costs and is independent of fluctuations in fuel prices are further advantages.

Hydro power output has grown only very slowly since the beginning of the 1970s. The aggregate annual energy output of harnessed rivers at the beginning of the 1980s was only 26% of the theoretical potential of all of Finland's water bodies and 60% of the harnessable potential. Hydro power stations now have a combined generation capacity of about 2,500 MW. It is unlikely that hydro power production will be increased significantly from its present level. The intention is to leave a considerable number of the unharnessed rapids in a natural condition (cf. 13.7).

Hydro power generation is also dealt with in chapter 5.

17.1.6 Regulation of water systems

Regulated lakes account for about 32% of the total lake area in Finland. Most regulation is done to meet the requirements of hydroelectric power stations, but it has also been done for flood-control purposes and to improve water-supply facilities. There was a particularly strong increase in lake-level regulation in the 1960s, when the total area of regulated lakes doubled. Permits to adjust flows are granted by Water Courts and are permanent.

Lake regulation has caused significant harm to aquatic life and fisheries as well as reduced the recreational value of water bodies. Damage is most pronounced in some northern Finnish lakes, in which the difference between the maximum and minimum water levels can be several metres. Water systems in southern Finland are not so strongly regulated, but their recreational use is so important that the adverse effects are felt all the more acutely. Constantly increasing recreational use and growing emphasis on ecological values have prevented the implementation of regulation projects on any significant scale in recent years. Demands that fluctuations in the levels of regulated lakes be adjusted in such a way that adverse effects are reduced are becoming increasingly common.

Plans to adjust regulation are already under preparation for a number of lakes.

17.1.7 Flood control and land drainage

Floods have been causing damage to agriculture, traffic and, to some extent, to homes in river valleys in the coastal area along the Gulf of Bothnia almost every year. The land in this region is very flat and river flow volumes fluctuate greatly. The problem is further exacerbated by the fact that isostatic recovery is making the land rise by up to a meter per century in the western part of the country while in eastern Finland the upheaval is considerably less.

Large-scale flood-control projects have been in progress in the region since the 1950s. Flood-control work has also been done in some water systems in southern Finland. A total of about 50,000 hectares have been protected by building levees, dredging rivers and building catchment basins. It is estimated that a further 70,000 hectares or so need protection from floods and that the work would be economic for about half of that area.

Subsurface drainage pipes have been installed in arable land at an average annual rate of 30,000 hectares since the beginning of the 1960s. 38% (950,000 hectares) of the total cultivated area in the country had been provided with such drains by the beginning of 1985 and it is estimated that another 800,000 hectares require them. This work often requires dredging of streams and arterial drains. Basic drainage work of this kind was at its maximum in the 1950s and 1960s. Subsurface drains are still being laid at a rate of over 50,000 hectares a year. It is estimated that basic drainage will have to be provided for about 20,000 hectares a year for the next 10 - 20 years.

17.1.8 Water-borne transport and log-floating

Geographical reasons make water-borne transport very important to Finland's foreign trade. Some 85% of total trade is carried by sea and the cargo volume was 50 million tonnes in 1986. Liquid fuels and coal account for more than half of the import cargo volume. Nearly half of total exports are forest-industry products. 8.0 million passengers were carried between Finland and other countries in 1986.

Inland waterways play an important role in transporting wood. About 15% of the total volume of logs supplied to mills is floated. The proportion was still 50% at the beginning of the 1960s. Most floating takes place on large water systems, where the distances involved are long enough to make this form of transport economic. Most logs are floated in bundle rafts towed by tugs. Only on the Kemijoki and Iijoki river systems in northern Finland are they floated loose.

The Vuoksi water system in eastern Finland is linked with the Gulf of Finland by the Saimaa Canal and therefore water-borne traffic is quite lively in the system. Oil products are also carried by boat in the Vuoksi system and it is the most important inland waterway in Finland for passenger and tourist traffic including boating. Tourist boat traffic

is also important on Lake Päijänne in central Finland and the River Kokemäenjoki in the South-West.

17.1.9 Conservation and care of the aquatic ecosystems and waterscapes

Several national programmes with the aim of conserving the aquatic ecosystems and protecting scenic values associated with water bodies have been prepared in Finland in recent years. These programmes have concerned, among other things, the protection of wetlands, rapids and marine and lake ecosystems. Programmes dealing with the protection of bogs, national parks and eskers have also closely concerned water resources. Those programmes are dealt with in greater detail in chapter 13.

Preserving or restoring the water ecosystems requires management measures. Harnessing, regulation and pollution have made it significantly more difficult for migratory fish to reproduce. Numerous projects to rehabilitate flowing waters by remedying the harmful effects of dredging or damming have been implemented. A national programme to revitalize stocks of migratory fish is currently under preparation. The implementation of a programme to protect waterfowl habitats will also require care measures and planning is already in progress for some of them. The scenic damage caused by harnessing and regulating water systems has been reduced by means of rehabilitative measures.

17.2 State and usability of water resources

In their natural state, Finland's water bodies are generally poor in nutrients. This together with the climate keeps them generally rather barren in character. Humus leached from extensive bogs gives the water a brownish colour. Brown, humus-rich (dystrophic) water is very typical of central and eastern Finland and the Gulf of Bothnia coastal region. Water is clear in sandy and moraine areas. Material leached from clay soils gives water in the coastal region of southern Finland a generally turbid appearance.

High sensitivity to changes is typical of Finnish water bodies. This is due to several different factors. Lakes are generally rather shallow and the exchange of water is relatively slow. The long period during which they are covered by ice makes them sensitive for oxygen-consuming material. Thus even the natural humus load is in itself a considerable burden on their oxygen balance. The buffer capacity of water is low. Those properties make it difficult for the Finnish water bodies to cope with the load caused by such factors as waste waters.

Waste water loads and certain other water-altering factors have lowered the quality of water bodies. Declining oxygen contents and eutrophication are particularly marked problems, in addition to which waste waters cause, to varying degrees, toxic effects, colour, odour and taste problems as well as turbidity. Large-scale peatland drainage has added to the humus load.

Anti-pollution measures on the part of industry and communities have brought about some improvement in the condition of water bodies since

the early 1970s. This is most evident in the most polluted areas. By contrast, there has been no substantial reduction in the total area of lakes whose water quality is classed no higher than fair, something that is partly due to an increase in diffuse pollution.

Most of the lakes (about 80%) in Finland have remained good or excellent where their water's usability is concerned. Those classed as satisfactory represented 18% of the total lake area at the beginning of the 1980s; two-thirds of these were headwater lakes or reservoirs heavily burdened by humus. In the case of one third (6% of the total national lake area), waste water loads had caused deterioration in quality. Lakes whose water was of poor or fair usability represented 2% of the total area. Those are mainly close to large population centres.

Finland's coastal waters are brackish and in their natural state poor in nutrients. The Baltic is one of the greatest basins of brackish water in the world. The salinity of the surface stratum in the Gulf of Finland is 4-7 o/oo and in the Gulf of Bothnia 2-6 o/oo. The number of flora and fauna species is low. The exchange of water is slow in the archipelagoes and the area is highly vulnerable to pollution.

One of the most important problems in the Baltic is the oxygen depletion and occurrence of hydrogen sulphide in the deeps of the Baltic. They are further increased by the rising trend of nutrients. The high correlation between the nutrient content and salinity may indicate an upheaval of nutrient-rich deep water, but at least in the Gulf of Bothnia and the Gulf of Finland as well as in the Kattegat and the Belt Sea the increased nutrient levels in surface waters are presumed to be caused by human activities.

Along the Finnish coast there are about 4,000 sq. kilometres of slightly polluted water areas. The effect of waste waters makes itself felt in those areas at least occasionally. Pollution is more clearly noticeable in areas totalling about 1,300 sq. kilometres.

Ground water is generally of good quality in Finland. Its main drawbacks from the viewpoint of water supply are its corrosiveness (due to generally high concentration of free carbon dioxide) and its high iron and manganese contents. The average nitrate content of ground water is always clearly below the level considered safe (30 mg/l NO_3). Heavy metal contents are also fairly low. Ground water reserves generally lie underneath a relatively thin permeable layer and are thus very susceptible to pollution.

17.3 Pollution loads and other water-altering activities

17.3.1 Industry

The overwhelmingly largest share of the waste water load borne by Finland's water bodies is caused by the pulp and paper industry, which accounts for over 90% of the total national BOD_7 water load. Those waste waters also contain large quantities of nutrients in addition to toxic and malodorous compounds.

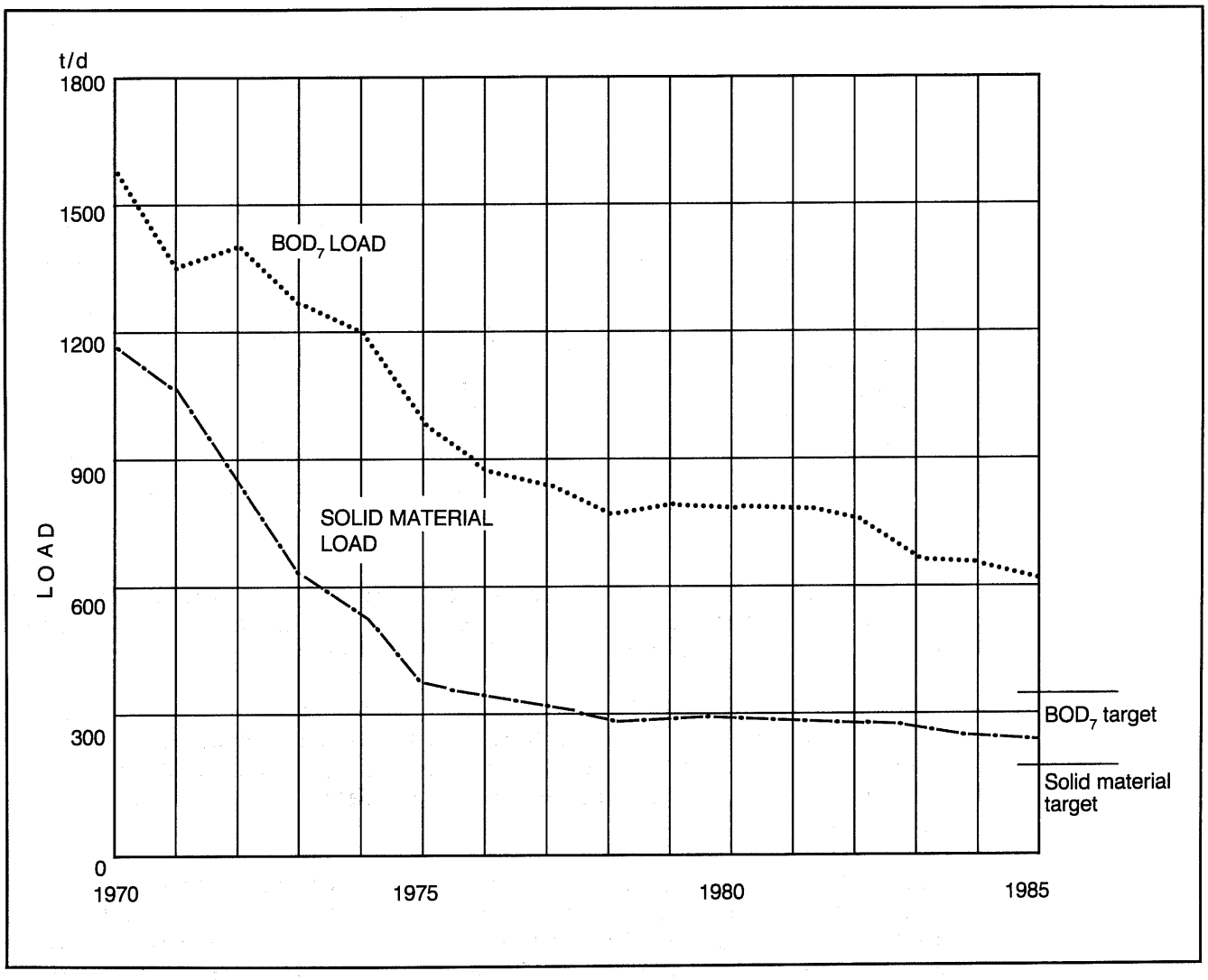


Figure 34. **Development of solid material and BOD_7 loads caused by the forest products industry between 1970 and 1985 and the target levels set with respect to those by the National Board of Waters in 1985.**

The pulp and paper industry's total BOD_7 load amounted to about 1,600 tonnes per day in 1970, but had fallen to about half that a decade later. The solid materials load declined by about 75% (from 1,200 t/d) in the same period. Many pulp and paper industry production units that cause the heaviest pollution load are located very unpropitiously along watercourses in the interior of the country.

About 30 of the Finnish chemical industry's production plants are significant in respect to their waste water loading. These include oil refineries and plants manufacturing plastics, fertilizers, chlorine, pigments, viscose pulp and explosives. Numerous other smaller plants also have deleterious effects on water bodies. Most chemical plants are located on the coast.

Table 41. The waste water loads caused by various industrial sectors in 1984.

	Load t/a		
	BOD_7	Phosphorus	Nitrogen
Pulp and paper	221,800	680	4,200
Chemicals	4,200	40	780
Foodstuffs	2,300	40	295
Textiles	55	5	15
Leather and furs	140	1	85
Mining and metallurgy	390	12	1,320

The foodstuffs industry is another major contributor to the waste water pollution load imposed on water bodies. Most of the factories included in this industry are connected to public sewer systems.

There are 50 mines in Finland, of which 15 ore mines are significant from the viewpoint of water pollution. The pollution load caused by the mining and metallurgical industry consists mainly of heavy metals, oils and cyanides. All but 7 of the country's textile factories are connected to public sewer systems.

Industrial-scale fish farming has been growing strongly since the 1970s. Production increased from about 2,500 tonnes in 1975 to about 11,000 tonnes in 1986. Because this activity requires a large quantity of good-quality water, it is mainly concentrated in areas that have remained in a natural condition. Most production is in the archipelago off the south-western coast, in the South-East in parts of the lake district and in the North-West in the province of Oulu. Fish farms discharged about 123 tonnes of phosphorus and 900 tonnes of nitrogen into water bodies in 1984. The greatest detrimental effects of this are eutrophication and turbidity.

17.3.2 Communities

In 1986, 73% of the population were served by public sewer systems. 85% of the total waste water volume was treated by biological-chemical means, 14% chemically and 0.4% biologically. 0.6% of waste waters were discharged into water bodies completely untreated or after mechanical treatment only.

Municipal waste water treatment plants continued satisfactory performing in 1986. At the end of that year there were 578 treatment plants in Finland. Ninety per cent reduction of BOD was attained at 270 of these plants and corresponding reduction of phosphorous at 290 plants. With respect to both parameters (BOD and P) 470 plants operated with a

treatment efficiency greater than 70 per cent. 85% of the organic material in waste waters treated at municipal plants was removed, 88% of the phosphorus and 35% of the nitrogen. The quantities of polluting substances discharged into water bodies each day with the treated waste water were: 47 tonnes of organic material, 1.4 tonnes of phosphorus and 38 tonnes of nitrogen. The organic material load has declined by about 60% since 1970 and the phosphorus load by about 70%.

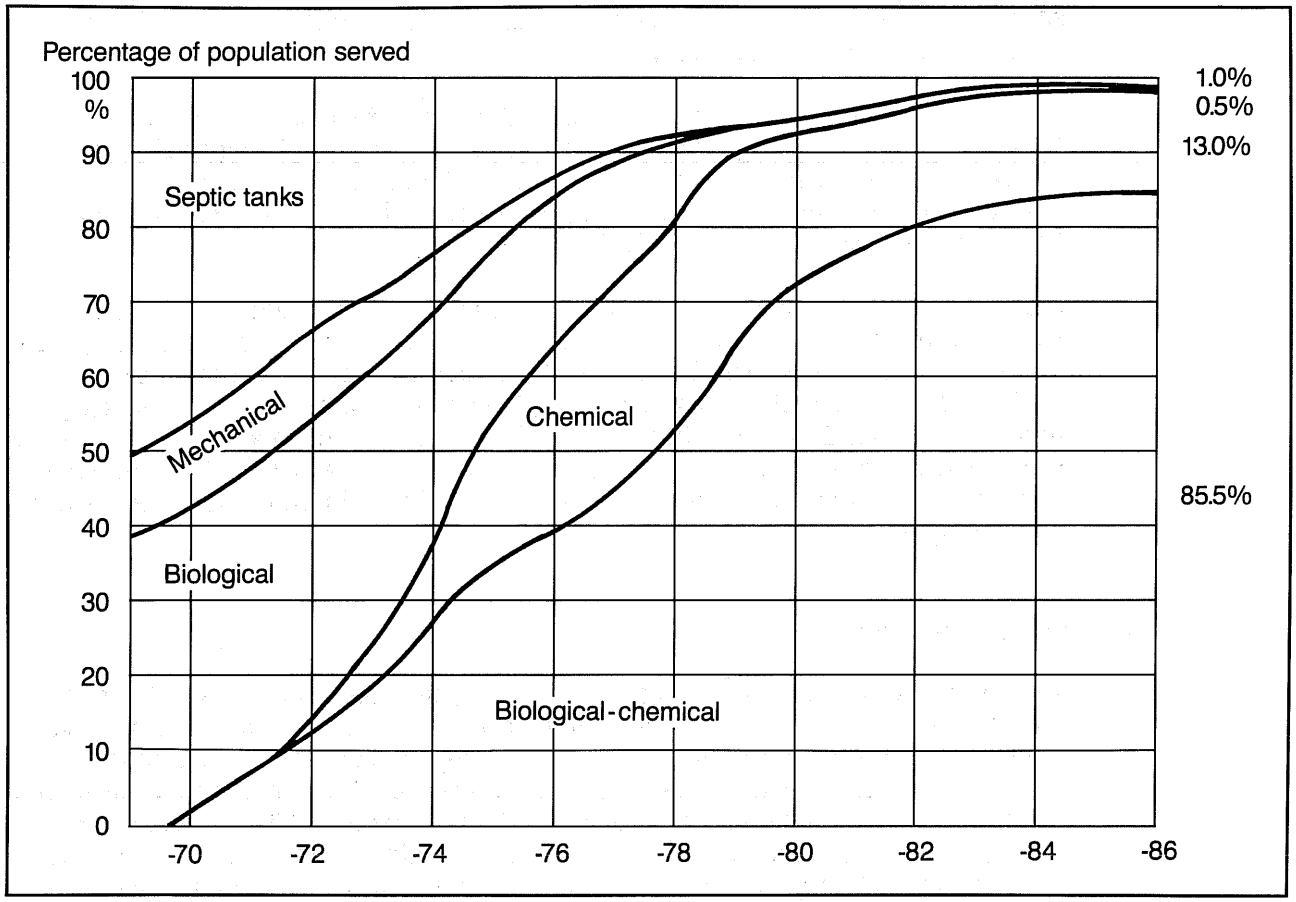


Figure 35. Development of municipal waste water treatment 1970-86.

17.3.3 Diffuse pollution

The major causes of diffuse pollution loads are agriculture and forestry, scattered settlements, holiday homes, forest drainage and peat extraction. At the same time as the load caused by industry and communities is declining, diffuse loading is increasing its relative share. Diffuse pollution is greatest in areas of intensive cultivation along the coast.

It is estimated that field crop cultivation causes a phosphorus load of 1,400 t/a and 31,000 t/a of nitrogen. Thus the phosphorus load from this source appears to be nearly as great as that caused by all the treated waste waters discharged in the whole country. It is estimated that animal husbandry causes a phosphorus load of about 400 t/a and a nitrogen load of 1,000 t/a.

In 1986, about 1.3 million people lived in dwellings not connected to public sewer systems. There are about 300,000 holiday homes in Finland, most of them close to shorelines. There are no estimates as to how much sewage from scattered settlement and holiday homes contributes to the pollution load.

Forest drainage is estimated to cause an annual load of about 36,000 tonnes of solid material, in addition to which it raises nitrogen, phosphorus and iron contents in water bodies. Viewed on a national scale, peat extraction affects water bodies only slightly, but its local impacts can be considerable.

Diffuse pollution loads are also caused by fur farms, waste dumps, transport, land drainage and storm water. Water-level regulation and construction in water systems have caused considerable changes in the aquatic environment and waterscapes, especially in Ostrobothnia and Lapland (see sub-chapter 17.3.5).

Airborne pollution has caused acidification of water bodies in Finland, too. Runoff and waste waters have also caused acidification locally. In general, Finland's water bodies have a low capacity to resist acidification. There are clear signs that rainwater is becoming increasingly acidic in Finland and studies of small, barren water bodies have yielded clear indications of lake acidification. Acidification of water bodies is not yet as serious a problem in Finland as it is in neighbouring Sweden and Norway.

17.3.4 Environmentally hazardous substances

Industrial waste waters bring with them numerous heavy metals into water bodies. The greatest contributor here is the chemical industry, which discharges over 300 tonnes of heavy metals into the aquatic environment each year. The most important of these are zinc, chromium, nickel, copper, cadmium, mercury, lead and arsenic. The metallurgical and mining industries also cause considerable loads. There has been significant success in reducing mercury discharges from chlorine plants. The highly acidic waste water produced when titanium dioxide is manufactured contains many heavy metals, and especially a high level of iron. The Finnish titanium dioxide plant by the Gulf of Bothnia has, however, in the beginning of 1985 taken into use a concentration plant which enables a more complete recycling of the acidic waste. Discharges of iron sulphate and sulphuric acid were thus reduced considerably.

Environmentally harmful substances in the pulp and paper industry's waste waters come from debarking and bleaching plants. These waste waters, which are created in various process stages, contain numerous process chemicals and reagents and wood-based compounds, such as chlorinated organic compounds and resin acids.

Industrial discharges of oil, iron, arsenic, cadmium and mercury have markedly declined since the beginning of the 1970s. No significant changes have been observed in the quantities of other heavy metals or other environmentally harmful substances discharged into water bodies by

industry. Depending on the level of production, emissions have fluctuated considerably from one year to another.

About 300 different pesticides are in use in agriculture. These contain about 150 active agents, sales of which totalled about 2,000 tonnes in 1984. This represents a doubling of the figure for 1970. The most important application is weed killing and the most common active ingredient in the products used for this purpose is MCPA. The use of DDT was abandoned in Finland in the 1970s. It is estimated that about 1% of the total quantity of pesticides applied in normal use finds its way into water bodies.

PCBs are not used in new equipment and products and the existing equipment containing PCBs are rapidly being removed from use. PCTs are not known to be used. The collection of mercury and cadmium batteries has started in the Helsinki metropolitan area and in some other cities and coarse amalgam is recuperated by individual dentists and dental clinics.

Harmful substances produced by industry, transport, energy generation or households also find their way into water bodies through public sewer systems. Also purification processes can produce dangerous compounds not all of which are, however, yet adequately known; e.g. treating waste waters with chlorine can increase the quantity of chlorinated organic compounds entering the environment.

The incidence of hazardous substances in water bodies has been studied on a fairly broad scale in recent years. Several heavy metals, especially mercury, DDT, PCB and chlorinated phenols are among the substances that have been studied and monitored. The monitoring of effluent discharges from industry and municipalities is an established national practice, whereas large-scale monitoring of the river inputs was started especially for the needs of the protection of the Baltic Sea. Finland participates in the Baltic Monitoring Programme of the Helsinki Commission. In addition about 200 other stations are visited in the open parts of the entire Baltic Sea. Part of the work is carried out within the framework of bilaterally coordinated monitoring with Sweden and with the USSR. The station network covers the entire Baltic Sea. The recent periodic assessment of the Baltic indicates that the DDT concentrations in fish and birds have decreased. Also the PCB concentrations have diminished in many areas. The metal concentrations in the Baltic are relatively low taking into consideration the great fresh water inflow. There have also been fairly extensive studies of oil occurrences, especially in the Baltic. The oil combatting equipment is continuously being improved, and the legislation concerning reception facilities at ports has been enforced.

17.3.5 Deleterious effects of construction in water systems

The extent of construction in water systems has been dealt with in sub-chapter 17.1. It has had harmful effects on the aquatic life including fish stocks,as well as water quality and scenery. The most extensive damage has occurred in northern Finland and in the region along the Gulf of Bothnia.

There are nearly 2,000 dams, which have prevented the migration of fish. Effective fish ladders have not generally been built beside these dams. The most extensive harmful effects have been caused by the obstruction of rivers flowing into the Baltic (see 17.1). The construction of hydro-electric power stations has destroyed rapids, which are essential for the reproduction of such species as salmon, trout, whitefish and lampreys.

River dredging has destroyed benthic species including crayfish on the spot and, in addition to silting, turbidity and higher iron levels further downstream. Drainage of land in which the soil contains sulphur has acidified water bodies. Large quantities of heavy metals have also been leached from soils of this type.

Until the 1950s, river rapids continued to be dredged on an extensive scale to facilitate log floating. This caused considerable damage to fisheries. In recent years, log floating having been discontinued in numerous watercourses, many rapids have been rehabilitated.

For the purposes of hydropower production and flood control several reservoirs have been built especially in the Ostrobothnian coastal region. Characteristic features of the water in these man-made lakes are its low oxygen content, low pH, high colour value, abundance of organic material and high nutrient and iron contents. These properties are sometimes in evidence further down the systems as well. Most of the reservoirs have good fish stocks, but the high mercury content of the fish limits their exploitation.

The effects of regulating water bodies depend on the intensity of this regulation. Regulation disturbs the aquatic ecology, reduces scenic values and generally harms fish stocks as well. Strong regulation causes leaching of nutrients and solid materials. Boating, fishing and shoreline use are also reduced.

17.4 Legislation and administration concerning water bodies

The administration concerning water was centralized in 1970 when the National Board of Waters was created. This is a central government board with a regional organization comprising 13 Water Districts. The National Board's responsibilities have included comprehensive planning of water resources management, prevention of water pollution, combatting oil spills, flood control, developing water supply and sewerage, promoting the recreational use of water bodies, hydroelectric generation, monitoring and supervision and research regarding Finland's water resources. Construction in water bodies is also included in the National Board's sphere of competence. Fisheries and the promotion of water-borne transport are the responsibility of other bodies.

The National Board of Waters has been administratively subordinate to the Ministry of Agriculture and Forestry, but it was transferred to the Ministry of the Environment on 1 October 1986, when its name was changed to "The National Board of Waters and Environment" (see chapter 8). However, the Ministry of Agriculture and Forestry has retained overall responsibility for the care of matters concerned with flood control, land drainage, water supply and sewerage. The National Board was relieved of responsibility for promoting the use of hydro power, but was given new

tasks connected with waste management and environmental research. The general supervision of combatting oil spills is the responsibility of the Ministry of the Environment, but the practical work is done by the National Board.

On 1 March 1987, the National Board of Waters and Environment had a staff strength of 415 This included 70 in the Water Resources Department, 87 in the Water and Environment Protection Department, 150 in the Water and Environment Research Institute, 87 in the General Department and 21 in other units. The district organizations employed a total of 1,150 (excluding workers on the various construction sites).

Matters related to the protection of the marine environment are also the responsibility of the Ministry of the Environment and the National Board of Waters and Environment. In addition the Finnish Institute of Marine Research monitors the state of offshore areas and the National Board of Navigation deals with water protection questions concerning seafaring. To advise the Ministry of the Environment on matters pertaining to the abatement of marine pollution a permanent Advisory Board for the Marine Environment has been set up. Members of the Advisory Board represent various sectors of the State administration and organizations representing, inter alia, industry, municipalities and harbours.

Finnish legislation on water is based on the principle, generally accepted in Nordic legislation, that water areas are mainly privately owned. However, legislation imposes limits on the owner's rights. The central principles of the Water Act are dealt with in chapter 7.

The Water Act, which entered into force in 1962, consists of 22 chapters and of more than 500 paragraphs. Among the matters dealt with in the chapters are construction in water bodies, the use of hydro power, water ways, log floating, drainage, regulating water bodies, , groundwater abstraction and waste waters. The Act also regulates the permission procedure, public inquiry, compensation and supervision.

17.5 Planning the use and protection of water resources

The use and protection of water resources is planned on the following levels:

- National level;
- Regional (general planning)
  - overall planning of water use and protection
  - general planning for individual water bodies;
- Project-specific.

Figure 36 sets forth the water-use planning system and other equivalent community planning. Land-use planning is dealt with in greater detail in chapter 15.

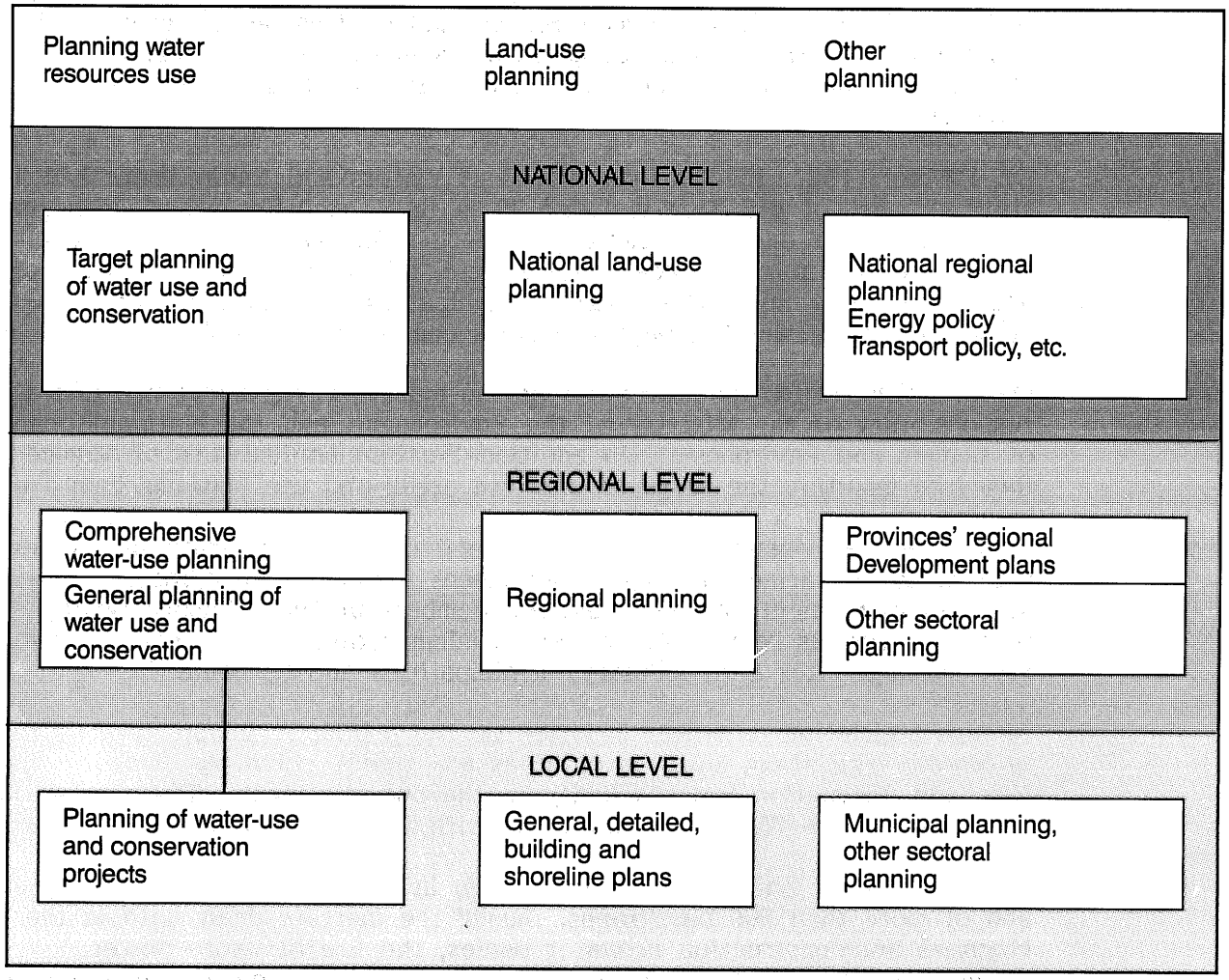


Figure 36. Planning of water resources usage and other corresponding community planning on various levels.

The first national programme of goals for water pollution control was completed in 1974. It contained general principles and goals in addition to targets for reductions in the waste water pollution load by 1980 and 1985. The programme was drafted and approved by the National Board of Waters. A programme of goals for water pollution control in the period until 1995 is currently under preparation.

The present principle is that ministries are responsible for national-level target-oriented planning. If necessary, the National Board of Waters and Environment assists in drafting plans. The development and expansion of target-oriented planning has been considered necessary.

Comprehensive regional water-use plans have been drawn up for the whole country, which is divided into 19 planning districts. The first of the plans was completed in 1974 and the last in 1983. They were drafted under the direction of the National Board of Waters. Regional advisory committees, which have included representatives of municipalities,

industry and organizations as well as other authorities, were created to follow the planning work.

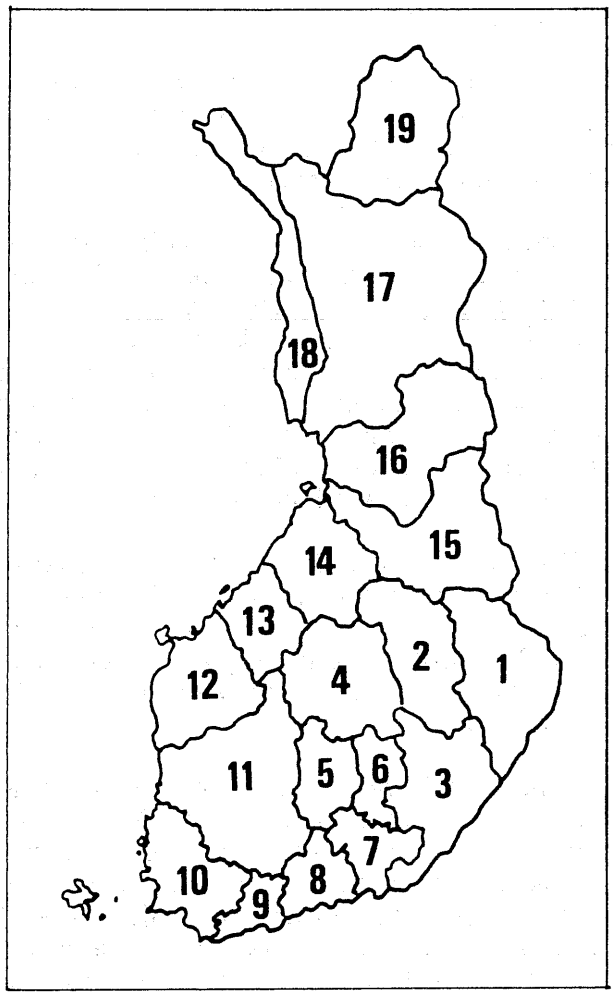


Figure 37. Planning regions for comprehensive water management planning.

The goal of comprehensive water-use planning has been to create medium- and long-range guidelines for regional water use and conservation as well as to provide a basis for decision-making in individual cases. Plans have been used with a view to reconciling contradictory goals relating to water resources. Regional goals and the most central measures in relation to protection of water resources are also incorporated in the comprehensive plans.

The comprehensive plans have been approved by the National Board of Waters and are used to guide planning and decision making with a bearing on water resources management. They are not binding on other authorities, municipalities nor water-users.

Comprehensive planning of water resources management has in many respects lived up to the expectations focused on it. Extensive basic studies of water bodies and their use, which serve as an aid in decision-making,

have been conducted in conjunction with planning, which has also been accompanied by a broadly-based public debate on problems and goals connected with the use of water. This has made it possible to gain an overall view of expectations and needs with regard to water bodies and of conflicts between the two.

The recommendations contained in the comprehensive plans are becoming outdated fairly rapidly, because they have been revised in only a few exceptional points since their completion. Continual revision would be a rather burdensome administrative procedure.

No decision to continue comprehensive planning of water resources use has yet been taken, but the matter has been studied in various connections. It has been proposed, among other things, that comprehensive planning should be linked more closely to regional land-use planning done by the Regional Planning Associations. Another proposal has been to the effect that planning should be linked more closely than at present to medium-range operational and economic planning in the administrative sphere. There is no desire to make plans more binding; instead, the aim is a flexible, regularly recurring planning process.

On the basis of the experience gained with comprehensive planning, work on drafting development plans for the use and protection of water resources was done experimentally in two areas in 1985-1986. The work was done by the National Board's district organization. After this it has been decided that regional development plans will be drawn up for the whole country in 1987-1989.

General plans for individual watercourses are made in areas where the need for planning is particularly obvious. In 1987 the National Board of Waters and Environment and its district organization were conducting planning in 53 areas. A plan applies mainly to protection of water resources and water supply and sewerage. Project-specific plans are drafted by the authorities in cases where also implementation of the project concerned is the task of the State. Such planning applies to projects involving flood control, land drainage, rehabilitation of water bodies, recreational use and fisheries, among others. Plans of this type were drafted for more than 200 projects in 1987.

17.6 Goals and measures in water protection

17.6.1 Implementing the 1974 programme of goals

A programme of goals completed in 1974 sets forth the general goals to be pursued in water protection and the principles on which measures are to be based. The programme also specifies goals with regard to reducing waste water loads. Goals for 1980 and 1985 are presented, on the basis of actual loads in 1972. Where communities are concerned, the goals have been implemented as set forth in table 42.

The goal with respect to communities has been achieved. The phosphorus load is clearly below the targeted figure. However, the goal set for the pulp and paper industry has not been fully achieved, but the success rate is nevertheless over 90%. In the cases of other industrial sectors,

too, the goals with respect to solid-matter and nutrient loads had been achieved for the most part by 1980.

Table 42. The target and the achieved BOD_7 and phosphorus loads in communities.

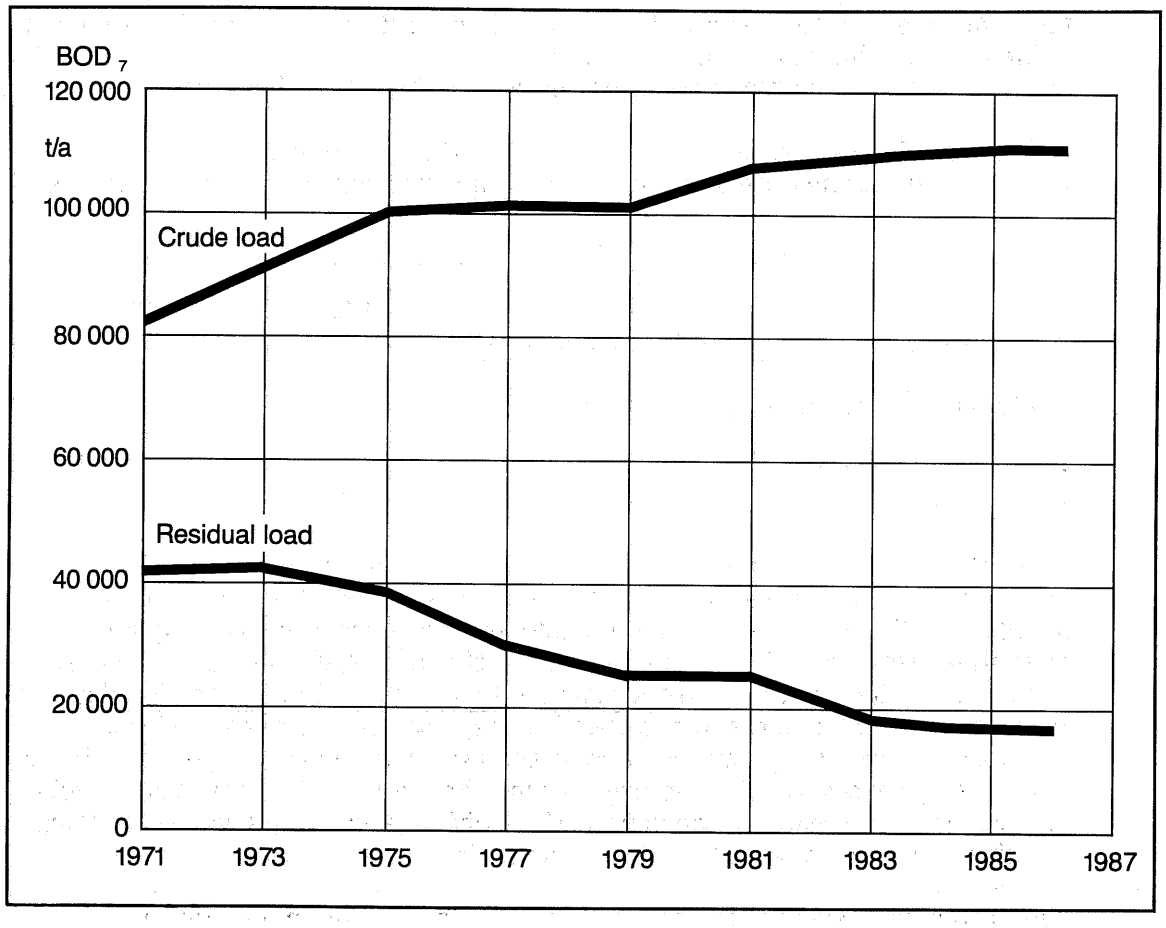
	1972	1980	1985
BOD_7 t/d			
• Goal	126	60	45
• Achieved		65	49
Phosphorus t/d			
• Goal	5.7	3	2.5
• Achieved		2.3	1.5

The 1974 programme also sets goals with respect to discharges of toxic and other environmentally harmful substances. The goals were not quantitative, but related to the substances' degree of harmfulness. Thus it is not possible to make a precise comparison between the goals and the development of their implementation. However, discharges of several substances have declined faster than the targets presupposed.

As can be seen from what has been said above, the goals set with regard to loads have been rather well achieved and in some cases even exceeded. The condition of water bodies has also been developing in the direction of the goals set, but this development has proved slower than was anticipated in 1974.

Table 43. Oil discharges by Porvoo and Naantali refineries and nutrient and mercury discharges by the chemical industry in Finland (t/a).

	1974	1976	1978	1980	1982	1984
Oil discharges	58	22	24	15	16	14
Phosphorus	95	56	56	64	39	38
Nitrogen	1,650	1,160	1,050	1,010	840	780
Mercury		0.25	0.12	0.11	0.12	0.13



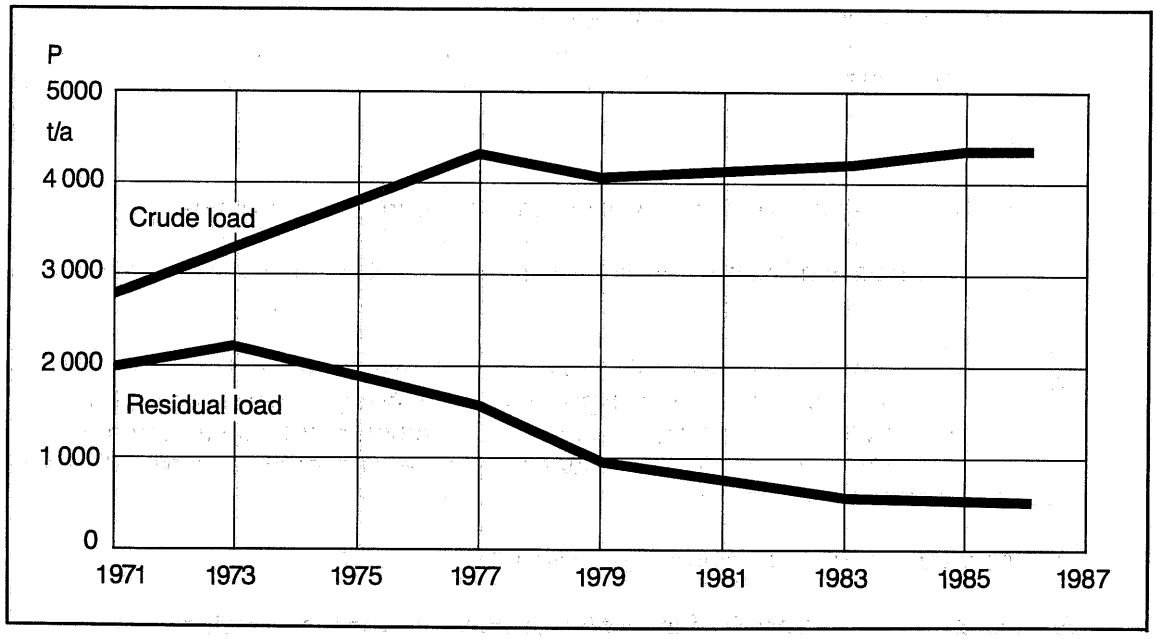


Figure 38. BOD and phosphorus loads in municipal waste waters 1971-86.

17.6.2 Basis for the goals

Water pollution control measures based on the following considerations:

- needs and goals relating to the use and protection of water bodies;
- requirements stemming from the state of water bodies and their properties;
- waste water load, quantities and quality;
- technical facilities;
- economic feasibility.

Already in the 1974 water protection programme it was emphasized that the goals should be set against the background of the water bodies themselves. At the moment, it is being demanded more and more generally that measures should be determined on the basis of the use of water bodies and the requirements stemming from their state. The development of mathematical models for water bodies, usability classifications, methods of assessing impacts and planning have improved possibilities of examining water pollution control from the perspective of water bodies themselves. In practice, however, the achievement of this goal will still require a lot of research and development.

The following considerations have been and remain important in determining water pollution control measures:

- the best practicable technology;
- feasible costs;
- efficiency;
- comparable and equitable water pollution control demands;
- the minimum pollution control level to be achieved by all polluters.

When new goals for water pollution control are being set, the matter should be examined from as comprehensive a perspective as possible. Here, the point of departure should be all substantial social impacts of water pollution control. Those impacts can be approached from at least the following perspectives:

- local and regional impacts on water bodies;
- effects on load-producing activities and in turn on society;
- general impacts on society.

17.6.3 Areas of emphasis in water pollution control

Preventing eutrophication remains one of the most central goals of water pollution control. In addition to that, it is increasingly necessary to concentrate on preventing toxic bioaccumulative substances from entering the aquatic environment. More attention will also have to be focused on combatting acidification. A marked increase in the efficiency of research, supervision and protection of groundwater resources will also be needed.

The chemical pulp and paper industry will remain the main focus of attention in the sphere of waste water treatment. Organic material and nutrients continue to cause fairly heavy loads. A constantly increasing amount of attention will have to be given to limiting discharges into water bodies of lignin, especially chlorolignins, and other organic chlorinated compounds and toxic substances. In particular, there is a need to monitor the use and environmental impact of auxiliary process chemicals.

Efforts must be made to make municipal waste water treatment plants operate more efficiently. Especially storm runoff water and infiltration have detracted from their efficiency. Pre-treatment of industrial waste water conducted into municipal sewer networks must also be put on a more efficient footing. The use of sewage water sludges for beneficial purposes must be raised to an even higher level.

Reducing the level of diffuse pollution shall become one of the main areas of emphasis in protecting the water environment. At least regionally, considerable harm is done by agricultural fertilizers and pesticides, livestock wastes, domestic sewage, forest drainage and peat extraction.

The main focus of efforts to protect the marine environment is on reducing the land-based pollution and especially diminishing the eutrophication of the Baltic Sea. A recommendation of the Helsinki Commission concerning the reduction of nutrients in municipal sewage is under preparation. Finland attaches great importance to this work as well as to the enforcement of a recommendation concerning the reduction of pollution from agriculture. Efforts are also being made for a comprehensive reduction of emissions of especially bioaccumulative substances. Effluents from oil refineries and from chloralkali industry meet for the time being the requirements set in the Helsinki Commission's recommendations, whereas other mercury losses from the chloralkali industry (to atmosphere and to products), introduction of oil into storm water sewers, and cadmium discharges at certain electroplating plants require measures to be taken. Other important goals include the provision of reception facilities for oil and chemical wastes in harbours in addition to ensuring adequate preparedness to deal with oil and chemical spills.

18 AIR-POLLUTION CONTROL

18.1 Emissions and air quality

Most air pollutants are produced by industry, power stations and transport. Factories emit particulates and odours as well as a great deal of sulphur compounds, which cause acidification. Sulphur emissions are the main negative effects of power stations, which also cause local problems with particulates and produce organic air pollutants harmful to health. Motor vehicles cause a great deal of the air pollution in population centres. Long-range transportation of air pollution does not yet cause concentrations directly harmful to human health or the environment in Finland, but is significantly contributing to soil acidification. Acidification is a serious threat to water quality and forest growth and, ultimately, to forest productivity, the forest products industry and our whole economy.

Sulphur emissions calculated as SO_2 totalled about 600,000 tonnes per year in the 1970s. This amounts to about 120 kg per capita, higher than the OECD average. Figure 39 shows the development of SO_2 emissions between 1950 and 1986 and their breakdown by source.

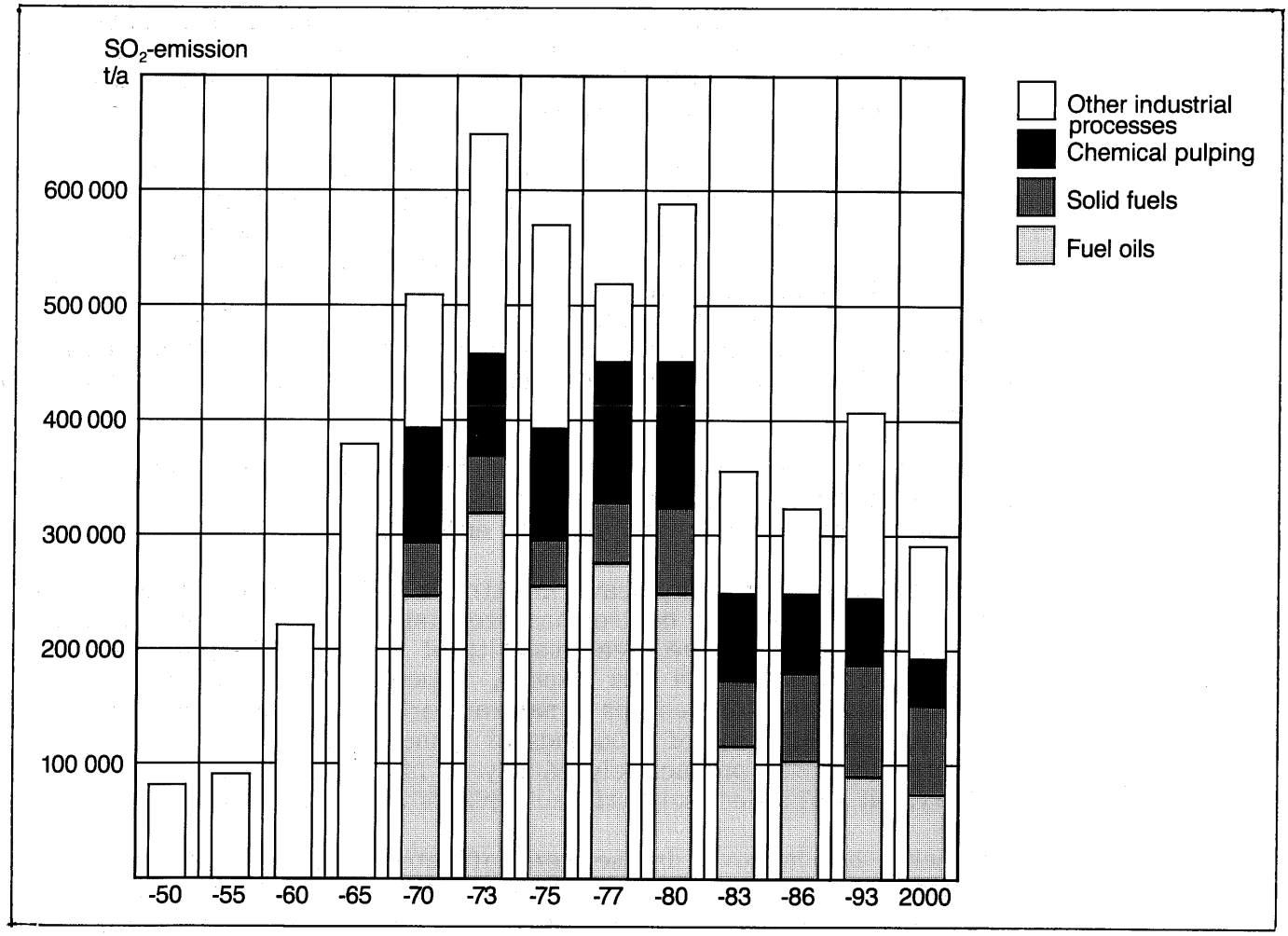


Figure 39. Development of sulphur emissions 1950-86 and breakdown by source.

There is considerably less information about emissions of other than sulphur compounds in Finland. It is estimated that emissions of nitrogen oxides totalled about 290,000 tonnes in 1980, those of hydrocarbons about 100,000 tonnes (emissions from forests not included), with the total of particulates emitted about the same. Emissions of carbon monoxide that year are estimated at nearly 500,000 tonnes. Motorized transport accounted for approximately 50, 80 and 60%, respectively, of the above-mentioned emissions of nitrogen oxides, carbon monoxide and hydrocarbons.

Malodorous gases, especially from chemical pulp mills, are one of the special problems of air-pollution control in Finland. Attention was drawn to the problem as early as the 1910s, when the work of an ad hoc body called the Sulphate Pulp Committee led to the enactment, in 1920, of a piece of legislation entitled "An Act on Certain Neighbourhood Relations" (The Neighbourhood Act).

Smell problems notwithstanding, the sulphate pulp cooking method continued to gain ground in Finland and by 1960 some 1,200,000 tonnes of pulp per year were being produced by this method, a total slightly more than that for mechanical pulp and slightly less than that for sulphite pulp. A decade later, chemical pulp output had risen to 2,700,000 tonnes a year and it is estimated that the total will have reached 4,000,000 - 4,500,000 tonnes a year by the early 1990s. By then, sulphite pulp output will be only about a tenth of the sulphate total, but mechanical mass will be produced nearly as much as sulphate mass.

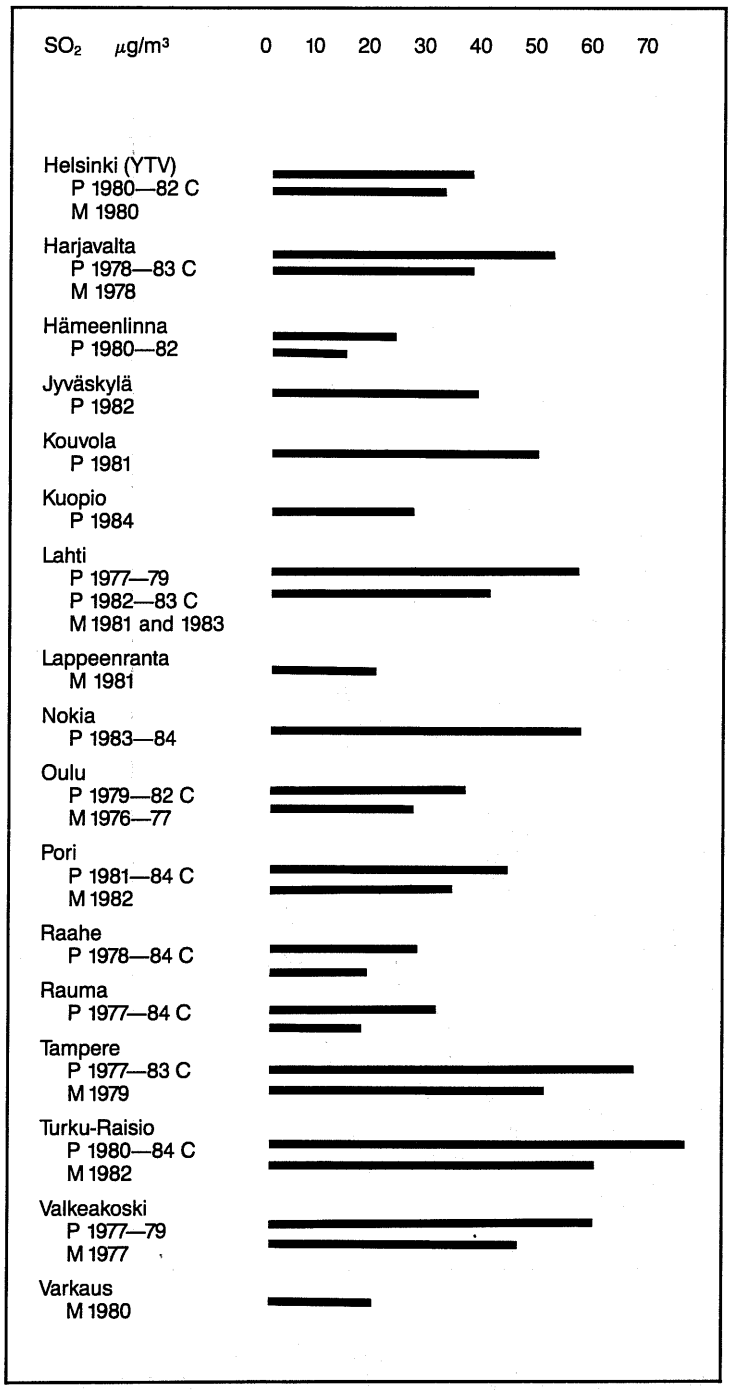
There were 18 sulphate pulp mills in 14-15 localities in Finland in the period 1977-83. Total emissions of reduced sulphur compounds are estimated to have been 12,000 - 14,000 tonnes per year as sulphur. About 5,000 tonnes of malodorous sulphur compounds were emitted by sulphite mills in 1977, and under 1,000 tonnes per year in the early 1980s. It is expected that as production facilities are modernized total emissions of malodorous sulphur compounds by the pulp industry will be reduced to 3,000 - 7,000 tonnes a year, depending on the effectiveness of air-pollution control.

The structural development of the pulp industry has in itself promoted air-pollution control, because sophisticated chemical-circulation systems in sulphate mills have greatly reduced emissions of sulphur compounds.

By international standards, heavy industry is a fairly new phenomenon in Finland and air-pollution control has been taken quite well into account in the construction of the great majority of facilities. Despite the inadequacy of legislation in this respect, reducing particulate emissions, in particular, has been seen as a natural part of building industrial and power plants. Hundreds of thousands of tonnes of sulphur compounds are recovered and used productively each year in the basic non-ferrous metals industry, oil refineries, sulphuric acid plants and viscose plants.

Air quality has improved in the worst-afflicted localities since several obsolete production lines and mills were closed down. Since 1970, sulphite, especially calcium sulphite pulp production, of which a high level of emissions of SO_2 is almost always characteristic, has been discontinued in about 15 localities. Some old iron and steel works have also been closed. Nuclear electricity generation has begun in two

localities (two reactors each). The energy-saving method of cogenerating electricity and district heat has begun in municipally-owned facilities in 11 localities and in conjunction with industrial production in 24 localities. District heating is supplied in 230 municipalities for 1,800,000 people and to buildings with a total volume of 400 million cubic metres. 85% of this district heat was generated in 26 of the country's largest towns and cities.



Key: P = metering period for which information is available

C = metering conducted on a continuous basis

M = material also includes concentrations calculated using a model, the years indicated "M" being the base year(s) for the emission data used in the model

The upper and lower bars indicate, respectively, the maximum and minimum annual mean values in the data.

Figure 40. Annual mean SO_2 levels in Finnish towns and cities according to data compiled by the Finnish Institute of Meteorology.

The most reliable data concerning air quality are based on sulphur dioxide measurements. As figure 40 shows, sulphur dioxide levels in our largest towns and cities do not generally exceed those recommended by the World Health Organization's (WHO) experts.

More than half the total sulphur precipitation stems from foreign sources. However, domestic sources account for a fairly large proportion of the total deposited sulphur over quite extensive areas, as figure 41 shows.

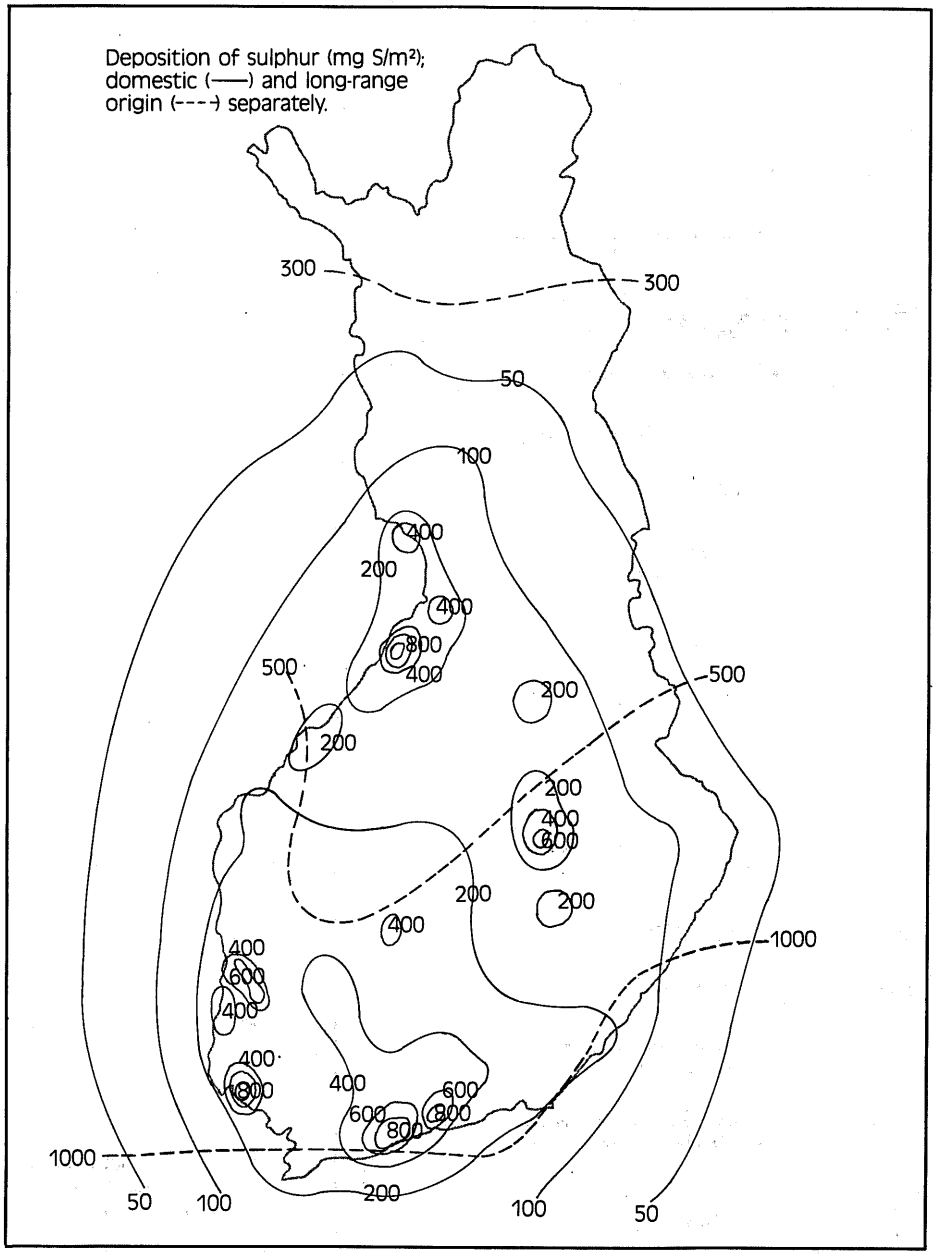


Figure 41. Annual deposition of sulphur originating in Finland (mg sulphur/m²). Based on estimated emissions for 1982-83 as assessed by the Finnish Institute of Meteorology (unbroken lines). Proportion of foreign origin estimated on the basis of the ECE/EMEP project (broken lines).

The only cases of illness directly attributed to air pollutants in Finland were diagnosed in Äänekoski in the late 1970s. The illness in question was an allergy caused by fungus spores. Some individuals were severely affected. Illnesses of this type are not unknown in working environments in Finland, although they are rare nowadays. General epidemiological considerations do not provide cause to expect ambient air pollutants to become a significant cause of illness. However, data concerning air quality in urban areas do indicate that in some localities pollution may adversely affect the health of some particularly susceptible groups. Recently (1986) published preliminary results of an epidemiological investigation in the city of Oulu indicate increased frequency of illnesses in the upper respiratory tract among children. Emissions of sulphate pulping and chemical industry are suspected to be their main cause.

Clearly deleterious effects on plants have been observed, especially in the case of coniferous trees in the immediate vicinities of both the largest urban areas and some industrial facilities. Forests totalling about 120,000 hectares are in the areas believed to be immediately affected. Most damage has been caused by sulphur dioxide. Other possible causes of damage include nitrogen oxides, fluorides, particulate matter and heavy metals (see 4.5.1).

The atmospheric supply of sulphur, the main acidifying component in deposition, has at least doubled in Finland in recent decades. Sulphate precipitation levels are 3 - 6 times higher in southern Finland than in Lapland. The atmospheric sulphur load exceeds 0.5 g/m^2 per year, which is the upper "safe" limit of deposition, almost everywhere in the country. With its acid bedrock and thin podsolic soils, Finland is highly vulnerable to acid rain.

A national water quality survey covering the period 1965-82 indicated increasing conductivity in 75% of the lakes examined. However, a declining alkalinity trend, which would be an indication of direct acidification, has not been so much in evidence. Declining trends in pH values are rare, which correlates well with the general theory of acidification in its initial phase.

Old (60 - 70 years) alkalinity results for some of the largest rivers are clearly higher than those nowadays being recorded, even for some rivers in nearly pristine condition. Small, vulnerable forest lakes were not tested earlier. The survey, which covered 11,000 lakes in all, revealed 600 with minimum surface pH values below 5.0. Analysis of sediment diatoms showed that some of the lakes (especially brown-water and esker seepage ones) had been acidifying for thousands of years. The clear-water lakes which have acidified in the second half of the present century are situated in areas of high sulphur deposition, acid bedrock and thin, coarse soils.

Even though the level of acid precipitation in Finland is considerably lower than in central Europe, both the nature of the bedrock and the climate may make ecosystems in this country particularly vulnerable to air pollution.

A five-year research project dealing with acidification and air pollution was launched by the Government at the beginning of 1985. Financing is being channelled through the Ministry of the Environment and the

Ministry of Agriculture and Forestry, with 9.05 million finnmarks the total earmarked for 1985. The project is focusing on the development of acidification as a result of sulphur and nitrogen emissions and, more generally, on problems associated with air pollution. The aim is to establish what cause-and-effect relationships are involved in air pollution and on that basis to:

- determine the extent of regional air-pollution impacts in Finland;
- find out whether the damage caused by air pollution is increasing;
- determine which areas and environmental components are particularly threatened;
- assess measures that would most effectively and at lowest cost, respectively, reduce damage by air pollution.

Most of the work involved in the project is being done in the form of sub-projects by research institutes and universities.

18.2 Legislation on air-pollution control

The Air Pollution Control Act and an explicatory Decree concerning its implementation entered into force in October 1982. Before that, air pollution mainly came within the scope of the Public Health Act.

The Air Pollution Control Act sets forth several preventative measures, including the following:

- General recommendations and regulations which may be issued by the Government concerning:
  - maximum permissible levels of air pollutants or ambient air quality;
  - the amount of emissions;
  - the composition of fuels or other products;
  - the idling of automotive engines.

- Anticipatory measures against air pollution:

  The Air Pollution Control Act strives for the most effective possible anticipatory measures against air pollution. An establishment which may constitute a source of pollution must be well informed about the possible effects of its activities on air quality. It must also take steps on its own initiative to prevent its operations from causing air pollution.

  Anticipatory measures on the part of various authorities also include ensuring that in discharging their duties they give

consideration to issues with a bearing on air-quality management and, if necessary, maintain contact with the authorities responsible for this sector.

- Notification procedure:

  Prevention of air pollution by individual industrial facilities is supervised with the aid of a notification procedure. Establishments listed in the explicatory Decree (Table 44) are obliged to notify the Provincial Office of their activities. About 1,300 establishments are required to submit such notifications, in addition to which 100 - 200 establishments which are either new or change the nature of their operations submit notifications each year.

  Official processing of notifications involves determining the situation of the establishment in question with regard to air-pollution control, considering the views of concerned parties and obtaining any submissions necessary. Information on notifications is published in newspapers circulating in the districts concerned.

  A private citizen has the right to submit a comment concerning an establishment to the local authorities responsible for air-quality management. In general, reminders have been issued concerning notifications, except in the cases of remote or small establishments.

  In most instances, these reminders have come from nature conservation bodies or residents' organizations, condominia managements and co-operative housing bodies as well as from public meetings. They have drawn the authorities' attention to nuisances, deleterious effects on the environment or human health and called for reductions in sulphur or particulate emissions, concentration of heat production, fuel changes or more efficient anti-pollution facilities. On the basis of a notification, the Provincial Office takes a decision, which may include binding regulations necessary to prevent air pollution. These can concern:

  - limits on emissions;
  - other protective measures relating to emissions;
  - monitoring emissions and their impact on air quality.

  The establishments concerned and the municipal authorities responsible for air-pollution control can appeal against a decision taken by a Provincial Office on foot of a notification. Private citizens, by contrast, do not have this right. So far, only about 110 decisions have been made by the Provincial Offices, and the final solution has yet been arrived at in only one case. under appeal. It is expected that there will be fewer appeals once precedents have been set and the notification procedure settles down to a regular pattern.

Table 44. Industrial establishments required under the Air Pollution Control Act to submit notifications.

Submissions by establishments existing before the Act came into force were staggered as follows: those listed under items 1 - 7 before 31st March, 1984; those in items 8 - 12 before 31st March, 1985, and those in items 13 - 19 by 31st March, 1986.

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1) chemical pulp mills
2) iron and steel works, sintering works or factories manufacturing ferrous alloys
3) cement factories, lime works and factories manufacturing asbestos products or mineral-based fibres
4) hazardous wastes treatment facilities
5) waste incinerators or any plants at which at least one tonne per hour or 5,000 tonnes per year of wastes are burned
6) plants manufacturing artificial fibres or their raw materials
7) power stations burning oil, coal, wood, peat or any other combustible substance, or boiler units with a maximum output in excess of 5 MW or at which the annual amount of energy in the fuel used exceeds 54 TJ
8) non-ferrous metal refineries and calcination plants
9) plants producing inorganic industrial chemicals such as acids, alkalis, chlorine, pigments or titanium dioxide
10) fertilizer factories
11) oil refineries
12) plants manufacturing basic organic chemicals
13) ferrous metal foundries with annual outputs of at least 500 tonnes or any other foundry or smelting unit with annual output exceeding 200 tonnes
14) fodder protein or bone meal factories
15) factories manufacturing synthetic rubber or raw materials for the plastics industry
16) stationary stone crushing plants or asphalt units as well as those which are transportable and operate at a specific location for a period of more than a year
17) battery factories
18) particle board or plywood mills
19) factories using materials containing volatile solvents, if the amount bound to or remaining in the product reduces by at least fifty tonnes annually, or if the maximum amount bound to or remaining reduces is more than 100 kilogrammes per hour.

18.3 Administration of air-pollution control

Figure 42 sets forth the administration of air-pollution control and the most important tasks involved.

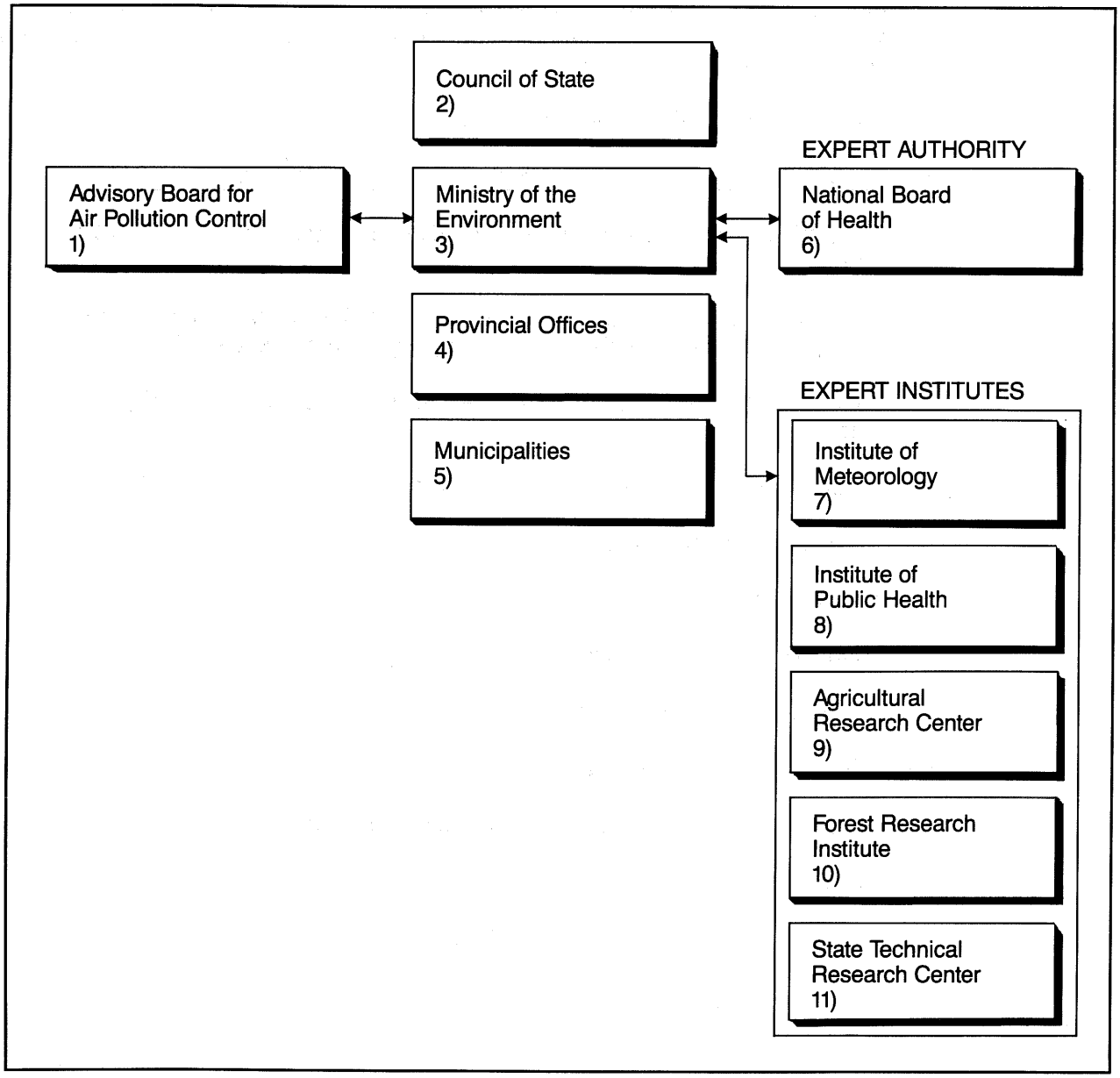


Figure 42. Authorities in charge of air-quality management,the Advisory Committee and Expert Institutes.

Explanation of functions in Figure 42:

1) Working under the auspices of the Ministry of the Environment; function: to promote the prevention of air pollution and concert prevention efforts by making proposals to the Ministry and providing submissions; representing state authorities and institutes which are most important from the viewpoint of air-quality management, together with central municipal and civic organizations and federations representing industry and energy production.

2) Issuing general directives and regulations.

3) Highest authority responsible for air-quality management.

4) Supervising and monitoring air-quality management on the provincial level.

   Processing air-pollution notifications submitted by industrial and energy-production facilities and issuing rulings concerning them.

5) Local control and support for measures aimed at air-quality management.

   Monitoring air quality in the municipality.

6) Effects on human health.

7) Air quality.

   Dispersion of pollutants in the air.

8) Effects on human health.

9) Effects on plants and agriculture.

10) Effects on forests and their economic aspects.

11) Metering emissions.

    Process and flue-gas treatment technology.

18.4 Air-pollution control policy and its implementation

18.4.1 General objectives and emphases

The objective of the Air Pollution Control Act is to prevent pollution of the atmosphere in order to ensure that all citizens, especially children, old people and those who suffer from respiratory diseases can breathe healthy, clean air. Aside from human health, a further goal is to protect flora and fauna and the rest of the environment as well as to prevent economic losses and a decline in the quality of life as a consequence of deteriorating air quality.

To date, the Government has made several decisions explicating the goals of the Act. According to the first, made in 1983, the maximum benzene level permitted in petrol is 5% and the maximum lead content 0.15 grammes per litre. The second Government decision define the guiding standards for air quality as shown in Table 45.

Table 45. Air-quality guidelines (effective from 1.9.1984).

Substance	Period	Maximum concentration
Sulphur dioxide (SO_2)	year	40 µg/cu. metre
	day	200 µg/cu. metre
	hour	500 µg/cu. metre
Airborne particulates (total suspended particulates)	year	60 µg/cu. metre
	day	150 µg/cu. metre
Nitrogen dioxide	day	150 µg/cu. metre
Carbon monoxide (CO)	8 hours	10 mg/cu. metre
	hour	30 mg/cu. metre

The guidelines also include a recommendation that the annual concentration of sulphur dioxide should not exceed 25 µg/cu. metre nor sulphur deposition exceed 0.5 grammes/sq. metre in large areas important for forestry, agriculture or nature conservation.

The main effect of these guidelines which are not legally binding as to the emission sources will be on long-term action against air pollution. There are no penalties for exceeding the recommended limits.

Most measures taken against air pollution in Finland to date have been on a voluntary basis and were implemented in conjunction with structural and production investments before the Act came into force (see 18.1). The current emphasis in air-pollution-control policy is on

- planning the reduction of sulphur emissions,
- air-pollution control in industrial facilities and power stations through the notification procedure,
- planning restrictions in emissions of nitrogen oxides, and
- improving the air pollution control of motor vehicles

18.4.2 Implementation of the Air Pollution Control Act

There is a need for a number of decrees by the Government and the Ministry of the Environment in order to make the notifications procedure and other measures against air pollution more effective. The air quality quidelines (see 18.4.1) and sulphur decisions (see 18.4.4.) are such decrees. One important decree made by the Government is the decision on quidelines for dust emissions from heat and power generation. This decree affects more than 1200 installations with heat output between 1 and 50 megawats. The particulate emission quidelines vary from 25 mg/MJ (50 MW) to 200 mg/MJ (1 MW) when using peat or other domestic fuels, from 15 mg/MJ (50 MW) to 90 mg/MJ (5 MW) when using fuel oil.

The notification procedure is a central means of implementing air-pollution prevention goals. About 1,000 notifications had been submitted to Provincial Offices by the end of 1985, but only about 100 decisions have been made. The Air Pollution Control Act requires notifications concerning new establishments to be made at least six months before operations commence. The personnel resources available to the Provincial Offices to deal with air-pollution control totalled about twenty person-years. According to reports from the Offices, it is not at present possible to process notifications flexibly; some of them can take years to deal with, something that does not constitute the flexibility envisaged in the decree.

So far, only little attention has been devoted to supervising the Provincial Offices' decisions. As the number of decisions made grows, monitoring their observance will also require more work.

18.4.3 Lowering traffic emissions

In its Report on Environmental Protection, submitted to Parliament on 27 September, 1984, the Government stated that more efficient steps are to be taken to abate air pollution caused by motor vehicles was. The traffic burden in population centres will be reduced by means of urban and transport planning. Finland is collaborating with the other Nordic countries to control emissions from petrol engines. Unleaded

petrol will have to be generally available from the second half of the 1980s to enable new vehicles to be gradually obliged to have more efficient exhaust gas filters. Research into possibilities of reducing air pollution by diesel engines will be intensified.

In developing regulations concerning the prevention of air pollution by motor vehicles and lead contents in petrol, the Finnish authorities have taken note of actions in those European countries in which traffic emissions cause more environmental damage than in Finland. The amount of lead used as a petrol additive never rose above 1,000 tonnes per year in Finland, and from the beginning of 1986, when the Government decision limiting lead and benzene contents (see 18.4.1) has fully taken effect the amount of lead added to petrol in this country is under 300 tonnes per year.

Unleaded petrol (95-octane; RON) has been on sale at increasing number of stations in various parts of Finland since 1.6.1985. In 1987 this number is 120. The Ministry of the Environment has published a list of car marks in use or on sale in Finland whose engines can use unleaded petrol without damage. The excise tax on unleaded petrol is reduced by 0.25 finnmarks per litre.

At a meeting in Stockholm in June 1985, Finland, together with 7 other states, signed a joint Declaration of Ministers of the Environment pledging stricter regulations on exhaust gases. It is stated in the Declaration that the effect of the new regulations would be similar to those now in force in the United States. However, Finland is unwilling to commit herself to any one single technical solution for reducing emissions, especially one that does not suit the vast majority of motor vehicles of the types traditionally used in this country. Under the supervision of the Ministry of the Environment, matters associated with the introduction of new regulations stricter than the present series of ECE (E) regulations have been studied. The Government is expected in autumn 1987 to decide on how the regulations are to be developed and on a timetable for the implementation of the new regulations.

In international contexts, Finland has emphasized the need for as broadly-based co-operation as possible in drafting regulations on exhaust-gas emissions and other actions to reduce pollution by hydrocarbon and nitrogen oxides.

18.4.4 Reducing sulphur emissions

In February 1985, the Government appointed an ad hoc Commission whose frame of reference includes drafting a programme for action to reduce sulphur emissions to 50% of the 1980 level.

It was estimated by the Committee that structural changes and clearly predictable measures aimed at protecting the air would lead to emissions falling from 584,000 tonnes in 1980 to between 280,000 and 400,000 in 1993.

Steps to reduce sulphur emissions have been taken in industry for a long time. The expenses incurred by processing industry in reducing these emissions in the first half of the 1980s provide an indication of what future costs will amount to. The oil-refining industry invested 120 million finnmarks for this purpose in the first half of the decade, and the basic metals industry 15 million in the same period. The cost of measures taken in this sphere by the chemical wood-processing industry have not been calculated separately from other investments. In the energy production sector, the additional costs involved in changing fuels to achieve lower sulphur emission levels can be considered investments to lower emissions, but it is impossible to estimate how much they amount to.

The Committee has also studied the degree to which these and other possible measures should be implemented and which sources of sulphur dioxide emissions they should apply to in order to ensure that the total national emissions are reduced to the extent desired. It has also presented a proposal on supervisory measures considered necessary and possibilities of implementing them. Important criteria was the selection of measures and allocation of resources, with economic considerations in the forefront. Special attention was devoted to reducing the deposition of sulphur in those areas currently worst affected as well as to reducing the highest concentrations in the air in urban areas.

The relevant decisions by the Council of State are based on the report presented by the Sulphur Commission. In February, 1987, the following four decisions were taken:

1. The sulphur content of light fuel oil or diesel oil must not, after 1.1.1989, exceed 0.2 percentage of weight.

2. Sulphur emission from new sulphate pulp mills (mills built after 1.7.1987) can at most reach a maximum of 4.0 kg per ton of pulp produced. Sulphur emission from other sulphate mills must not, after 1.1.1998, exceed 6.0 kg per ton of pulp produced.

3. Sulphur dioxide emissions from sulphur acid plants using gas with a SO_2 content of less than 7 per cent must not exceed 15 kg per ton produced, calculated as hundred per cent sulphuric acid. Sulphur emissions from new sulphuric acid plants (built after 1.7.1987) using gas with SO_2 content of 7 per cent must not exceed 4.0-5.0 kg per ton produced, and sulphur emissions from corresponding old plants must not, after 1.1.1993, exceed 5.5-7.0 kg per ton produced.

4. Emissions of sulphur dioxide from new mainly coal-based power plants (built after 1.7.1987) with an efficiency of 50-150 megawatt must not exceed 230 milligrammes per megajoule. Emissions from power plants with an efficiency of over 150 megawatt must not exceed 140 milligrammes per megajoule. Emissions of sulphur dioxide from plants having an efficiency of over 200 megawatt must not, after 1.1.1994, exceed 230 milligrammes per megajoule.

Moreover, the Ministry of the Environment has worked out draft decisions to be discussed in the Council of State in November, 1987 with the following regulations:

1. Sulphur dioxide emissions from power plants using heavy fuel oil must not, after 1.1.1991, exceed 500 milligrammes per megajoule in the densely inhabited areas in Southern Finland, and not 1350 milligrammes per megajoule from plants in other parts of the country.

2. Coal imported to the country for other plants than those provided with desulphurization equipment must not, after 1.1.1988, contain more than 1.2 per cent sulphur, and after 1.1.1994, not more than 1.0 per cent sulphur.

3. Sulphur emission from oil refineries must not, after 1.1.1993, exceed either 8 or 12 per cent of the sulphur received at the refinery, depending on the size of the refinery.

19 WASTE MANAGEMENT

19.1 Current status

The general task of waste management is to collect and receive all investment and consumer goods which have been discarded from use as well as the material flow formed by various emissions and, to the extent possible in each particular case, to re-use them as production raw materials or to generate energy. Whenever practical considerations make it impossible to follow that procedure, the task of waste management is to direct the material flow into the ecocycle in such a way that damage to the environment does not occur.

19.1.1 Generation of wastes

The total quantity of wastes generated in Finland each year is in the region of 70 - 80 million tonnes. Here, the term "wastes" is understood in quite a broad sense and includes some secondary raw materials within production cycles.

The quantity of community wastes (including household wastes and their equivalents produced by the commercial, services and industrial sectors) accumulating in a year has been estimated at 2 - 3 million tonnes. Construction (including earthmoving) produces 5 - 10 million tonnes of wastes and sewage treatment plants more than 1 million tonnes of sewage sludge. Wastes produced in the agricultural and forestry sector (animal faeces, straw and wood harvesting wastes) come to about 38 million tonnes a year. The quantity of wastes produced by mining and ore-enrichment operations is estimated at 11 - 15 million tonnes a year. Other industrial operations generate about 16 million tonnes a year. The total quantity of hazardous wastes produced in Finland each year is about 200,000 tonnes.

Both the above-mentioned accumulations and the quantitative data on the utilization and other handling of wastes are indicative only. Systematic statistics dealing with wastes have not yet been developed in Finland. The absence of regularly compiled and dependable data dealing with the accumulation and processing of wastes as well as deficient data on the costs involved in managing them (particularly where industry is concerned) is one of the obstacles to planning and implementing waste management and monitoring observance of legislation covering these activities. However, preparations for statistical monitoring of wastes have been begun in the form of a collaborative project between the Ministry of the Environment and the Central Statistical Office of Finland.

19.1.2 Management of community wastes

In Finland 2 - 3 million tonnes of community wastes are produced each year, with households contributing just under 1 million tonnes of this total. In addition to this, 1 - 2 million tonnes of building wastes and 2 - 7 million cubic metres of soil residues are produced. About 1.1 million cubic metres of sewage sludge (with a dry weight of about 130,000 tonnes) was produced in 1982. Some 250 - 600 kilogrammes of community wastes

and 180 - 210 kilogrammes of household wastes (including the part that is recycled) per capita are produced each year. The annual accumulation of community wastes in Helsinki is shown in Table 46.

Table 46. Accumulation and breakdown of community wastes in Helsinki.

Type	Annual quantity Tonnes	Share %
Paper and cardboard suitable for recycling	80,000	40 [1]
Other paper and cardboard wastes	40,000	20
Food wastes	20,000	10
Other organic wastes	20,000	10
Plastic	10,000	5
Glass	8,000	4
Metal	4,000	2
Clothing and textiles	2,000	1
Wood	4,000	2
Other wastes	12,000	6

1) including the recycled part

Local authorities are statutorily required to arrange the transport of community wastes in population centres, unless the Municipal Council in question has decided that this should be done on a contractual basis, i.e. under contracts between companies which provide such services and property owners. The latter course has been followed in the vast majority of municipalities. Between 3 and 3.3 million people live in areas covered by organized waste transport services. Wastes are generally collected in 600-litre bins on multi-family and commercial properties and in 200-litre sacks in areas of single-family dwellings. The wastes are then removed to dumps (landfill sites) by contractors or the municipality. This is mostly done using modern compactor-type trucks.

Nearly all community wastes are disposed of at the landfill. A register maintained by the Ministry of the Environment lists a total of 1,071 dumps, of which 755 are used for community wastes, 73 for surplus soil and building wastes and 111 for snow removed from streets, courtyards, etc. Nearly 65% of the landfills used for community wastes are small in size, i.e. they serve populations of less than 3,000. 31.4% are medium-sized, serving populations of 3,000 - 30,000, and only 4% serve populations of over 30,000. According to information supplied by dump managers, a total of about 3.3 million tonnes of wastes were disposed of at landfill sites in 1983, with community wastes accounting for 1.5 million tonnes of this total. 75% of the landfills used for community wastes are located on impermeable ground and the remaining 25% on permeable ground.

At its greatest extent, incineration of community wastes accounted for under 10% of the total quantity. Incineration has been carried out in three largish plants since the 1960s. Today, only one of them is in operation, the other two having been closed down because they were causing air pollution.

Preliminary grading of wastes and facilities to scrub flue gases sufficiently to meet environmental norms are considered minimum preconditions for incinerating community wastes.

Paper intended for recycling is separated from other wastes at the point of waste production. There is also separate collection of glass, albeit on a smaller scale. There are no mechanical sorting facilities for community wastes in operation in Finland at the moment, but there are plans to provide such facilities in a number of urban centres. There are two smaller plants in which dry wastes are handled manually and the components (paper, cardboard, plastic, wood, glass and metal) separated and forwarded for re-use.

A municipality can finance its waste management by levying a charge for this service. The principal bases on which it is determined are the type, character and quantity of wastes involved as well as the frequency of collection. In those municipalities where a waste management charge is levied, the average treatment charge is about 40 finnmarks per tonne and that for transport 300 finnmarks per tonne. The corresponding figures in the Helsinki metropolitan region are 150 and 370 marks.

According to municipal financial statistics, municipal waste-management charges over only 60% of the total municipal waste-management costs nationally, 65% in towns and cities, and 15% in rural municipalities. However, the largest part of the costs included in communities' waste management is not covered by municipal statistics. The reason for this is that the vast majority of transport services are provided by private contractors. It has been estimated that the total costs of waste management services arranged by municipalities come to about 500 million finnmarks. The aim is that municipalities should charge the full amount of costs incurred in waste management. Here, either a flat-rate or graded charge could serve as an economic sanction to promote re-cycling.

The central problems in arranging waste management are:

- there are too many small landfills;
- a considerable number of them are not supervised and/or are badly managed;
- hazardous wastes have been - and are still being - deposited in landfills (including some that have been closed down);
- recycling or re-use of community wastes is inadequate in scale;
- the number of persons employed in planning, implementing and supervising waste management is inadequate;

- the municipalities control the transportation of community wastes only to a limited degree.

The goals of the management of community wastes are to reduce the quantities disposed of at the landfills, to increase the recycling and re-use, and prevention of environmental damage in the environs of dumps. Here, the main goals are:

- reducing the number of small, often unsupervised, landfills;
- preventing hazardous wastes from being deposited in landfills;
- determining what landfills are hazardous and, if necessary, restoring them;
- improving initial sorting for different types of wastes (paper, cardboard, plastic, glass, separate collection of hazardous domestic wastes, etc.);
- improving centralized sorting of selected types of wastes (e.g. packaging waste from the commercial and industrial sectors);
- development and trial operation of mechanical sorting technologies (in order to obtain raw materials, fuel and/or compost);
- reducing the use of disposable packaging;
- developing the system of permits for landfills and concentrating responsibility for this in the hands of regional authorities instead of local authorities.

The achievement of those goals presupposes the development of inter-municipal co-operation and the preparation of regional waste-management schemes and programmes. This has been done in some cases, for example by regional planning associations. The Ministry of the Environment has begun determining the need for improvements to landfills. Some urban municipalities have implemented research and pilot projects dealing with preliminary sorting of wastes. State support can be granted for the construction of a centralized mechanical sorting facility. In the initial stage, it would be appropriate to provide such aid for one pilot facility only.

19.1.3 Management of hazardous wastes

The yearly accumulation of hazardous wastes in Finland has been estimated at 200,000 tonnes. This can, however be considered indicative only.

The leading principle adopted in Finland in the late 1970s in relation to hazardous wastes was that their management should be based on centralized processing in a national facility. This solution was arrived at for both financial and environmental reasons. It was based on several

reports, from which it emerged that the industrial sector was not able to deal with the question by, for example, taking care of its own wastes or setting up a facility of its own. The final outcome was a joint decision on the part of Finland, the central organizations, municipalities, Helsinki Metropolitan Area Council (YTV) and industrial interests to establish a company called Suomen Ongelmajäte Oy (Finnish Hazardous Wastes Ltd), which has since been renamed Ekokem Oy Ab, in 1979.

The Waste Management Act set quite strict conditions for the granting of hazardous wastes management permits. One of those legal requirements is that the establishment or siting of a processing facility for hazardous wastes or the processing of such wastes be in the public interest as well as necessary and appropriate from the viewpoint of the national development of the management of hazardous wastes.

Ekokem Oy Ab began accepting hazardous waste in early summer 1984. Its treatment capacity is about 60,000 tonnes per year. The wastes are processed in incinerators, chemical post-processing facilities and then deposited in a special dump. The lay-out of the facility is shown in Figure 43.

Organic hazardous wastes are incinerated in a rotating, drum-type kiln (Figure 44) about 12 metres long. The incinerator has an annual capacity of 30,000 tonnes. Depending on the substance being incinerated, the temperature can be set at between 900 and 1,300°C. The thermal energy produced is used to generate district heat for the city of Riihimäki. Ekokem Oy Ab produces about 40% of the town's requirements during the heating season. The provisions concerning Ekokem Oy Ab's emissions and their supervision are extremely strict.

Among the substances treated by the chemical plant are chromates, acidic, alkaline and cyanide solutions and hydroxide sludges, which are reduced to low-soluble sediments.

The ash, slag and sediments which are the end products of the processing chains are disposed of in a special dump, together with some processed hazardous wastes arriving directly from industrial plants.

The total investment in Ekokem Oy Ab's facility was about 250 million finnmarks. The average charge for waste treatment was about 1,700 finnmarks per tonne in 1985. The facility's turnover for the year was about 54 million finnmarks, which is in accordance with the budget.

In addition to Ekokem Oy Ab, permits to treat hazardous wastes have been granted to about 15 companies, the vast majority of which pre-process oil wastes and oily water. Considerable quantities of hazardous wastes are also treated at their points of origin. These operations are supervised with the aid of plans approved by the waste management authorities. So far, no summaries have been made of hazardous wastes treatment in accordance with waste management plans. Small quantities (about 1,000 tonnes per year) of hazardous wastes have been exported.

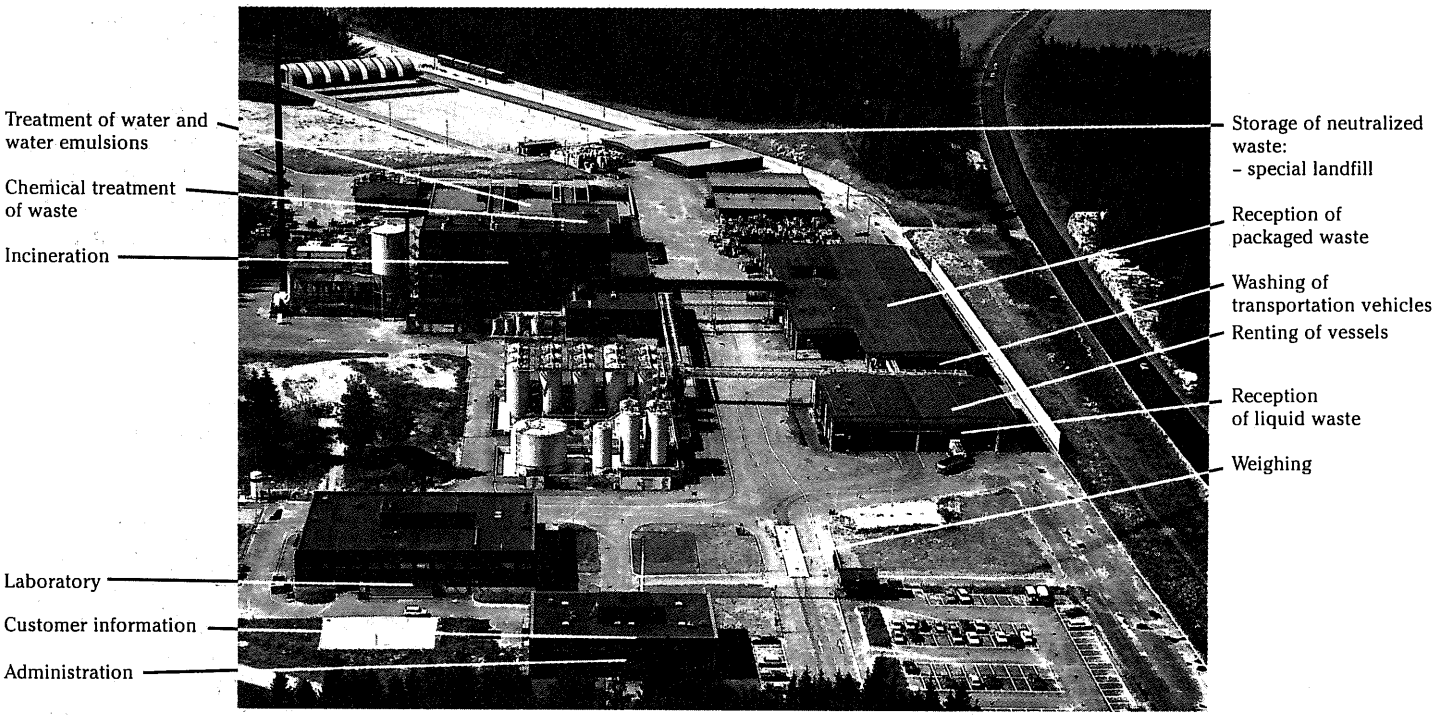


Figure 43. The lay-out of Ekokem Oy Ab's treatment facility.

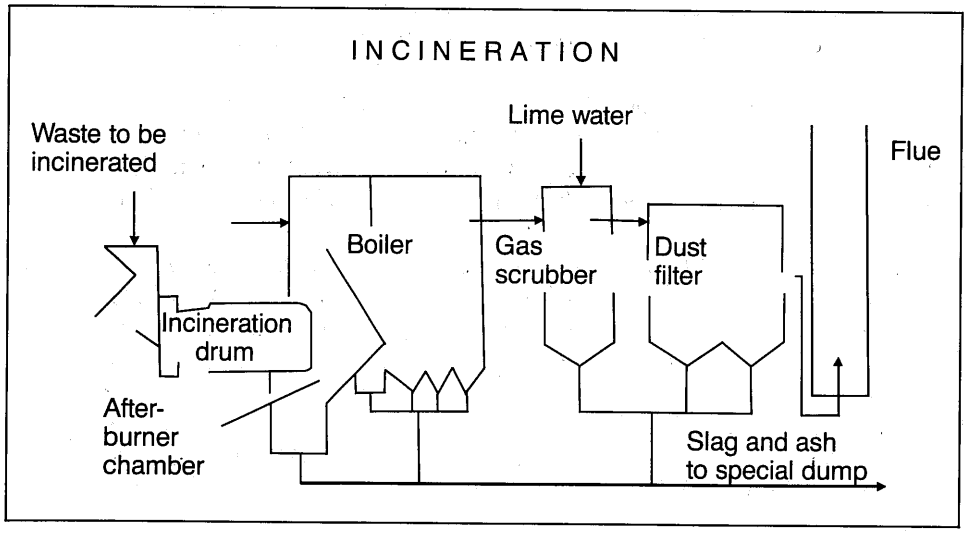


Figure 44. The incinerators of Ekokem Oy's treatment facility.

In 1984, the Ministry of the Environment separately studied the treatment of waste oil by sending a questionnaire to professional collectors. They reported that they had forwarded about 32,000 tonnes to nearly 140 treatment points. More than half of this quantity ended up being burned in smallish incineration plants, which did not have either a hazardous wastes processing permit as required by law nor an approved waste management plan.

Hazardous wastes are mainly collected and transported for centralized treatment either by Ekokem Oy Ab or by industrial plants that produce such wastes. In addition to this, the Waste Management Act requires municipalities to organize the collection of hazardous wastes from households as well as for oil wastes from households, agriculture, service-providing properties and industrial establishments (provided the quantities of oil wastes involved are not unduly large). So far, however, not enough appropriate collection facilities have been provided. The establishment of regional collection facilities is currently under consideration as well. These would be intended particularly to put the collection of hazardous wastes from small and medium-sized industrial establishments on a more efficient footing.

The main problems associated with arranging the management of hazardous wastes are:

- these wastes are still being taken to illegal and, from the viewpoint of environmental protection, inappropriate places for treatment and/or disposal (dumps, small oil-fired heating plants, and so on);
- municipalities have not established enough collection facilities for oil and other hazardous wastes;
- the supervision resources available to the waste management authorities are inadequate, especially on the municipal level.

Nevertheless, a general assessment indicates that the level of hazardous wastes management has risen since Ekokem Oy Ab opened its facility, and continues to rise. In 1986, the amount of hazardous waste treated by Ekokem Oy Ab was 53,400 tonnes. Relatively large sums are charged for the treatment of hazardous wastes and have defined something that did not previously exist, i.e. a reference price, with which other disposal alternatives (e.g. reducing the quantity of wastes or making better use of them by altering raw material inputs and process configurations) can be compared. This may well be a contributory factor in the declining accumulation of hazardous wastes that has been noted. On the other hand, it is obvious that some of these wastes are "hidden" in various stores in anticipation of lower processing costs, or have been sent for less expensive illegal processing.

The most important tasks in the development of hazardous wastes management are:

- making implementation of the Waste Management Act more effective;

- tightening up some of the regulations contained in the Act;
- imposing restrictions on the use of certain particularly hazardous products, which are especially difficult to dispose of after they have been used;
- the establishment of regional collection stations;
- raising the standard of municipal collection facilities and improving the services which they provide;
- making the maintenance and supervision of dumps more effective;
- developing economic incentives;
- improving information and training;
- increasing the resources available for supervision.

19.1.4 Re-use and recycling of wastes

A breakdown of wastes by type and current degree of utilization is set forth in Table 47.

The types of wastes that have been traditionally well utilized are metal scrap (90% recycled, including material flows within industry) and paper and cardboard (45% recycled).

Metal scrap is collected by about 250 dealers, who supply it to the metal industry through several wholesalers and a company owned by the industry itself.

About 50 dealers specialize in collecting car junks and supplying it to two wrecking yards, which handle about 80% of the cars scrapped each year. The goals in relation to making scrap collection more efficient focus on large-sized domestic items and, in sparsely populated areas, agricultural scrap and vehicles.

Recovery of paper and cardboard (over 300,000 tonnes a year, including industrial paper) is based on sorting at the points of origin. Most collection is done by about 140 professional collectors, with civic organizations (such as the athletic clubs and youth organizations) also playing a significant role. Paper collection is co-ordinated by one company owned by the wood- and paper-processing industry, Paperinkeräys Oy (Paper Collection Ltd), which has reception and sorting facilities in the three largest cities, Helsinki, Turku and Tampere. The recovery targets for paper focus on improving the collection of paper and preliminary sorting of cardboard from private households. The limited capacity of the paper industry to use collected paper from households - due to export-orientation, competition on quality, etc. - has inhibited growth in the recovery percentage, which is currently 35-40%. However, the installation of new de-inking capacity in soft-paper production plants combined with increased use of recycled paper in manufacturing building insulation material is likely to improve this situation.

Table 47. An estimation of wastes by type and degree of utilization in 1983.

Type of waste	Accumulation 1,000 t/a	Degree of utilization, %
Agriculture and forestry		
Wood harvesting	15,000	2
Straw	4,000	10-25
Manure	19,000	100 (50 [1])
Mining and ore-concentration		
Mine and concentration plant wastes	11,000-15,000	10-30
Building		
Construction wastes	5,000-10,000	. .
Sewage treatment plants		
Sewage sludge	1,100	50
Other activities		
Timber wastes	10,000	85
Metal industry slag and sediments	1,400	72
Iron and steel scrap	900	90
Other metals	110-120	90
Gypsum	850	1
Paper and cardboard	815	45
Ash	650	40-50
Glass	70	15
Textiles	25-30	20
Plastic	90-110	15
Rubber	40-45	5
Food industry wastes	280-300	95
Leavings of food	150	5-10
Hazardous wastes[2]		
Ferrous sulphate	280	20-25
Oil	70-80 [3]	60-70
Solvents	11	35-40
Paints and glues	15	5
Acids	180-190	. .
Alkalines	80-90	. .
Heavy metals	33	1
Other hazardous wastes	2	-
Community wastes[4]	2,000-3,000	10-20
Total accumulation	70,000-80,000	

1 Real soil-improvement effect
2 Not necessarily hazardous waste as defined in the Waste Management Act
3 As 100% oil
4 Quantitative data mainly included in figures stated elsewhere

Other types of wastes that are utilized to relatively high degrees are slag from the iron and steel industries (95%) and ash from power plants (40-50%), which is used as raw material in the building materials industry and as a soil-improvement agent, wood-processing waste, used as a raw material for fibre materials and as fuel, as well as food-industry waste, which is used almost entirely in the manufacture of animal feeds.

60-70% of waste oil is used as fuel. On the other hand, some waste oil (including solvents) is still being illegally burned in small oil-fired heating plants, which are not equipped to meet environmental protection requirements nor the Waste Management Act's regulations with respect to hazardous wastes. Finland has no nationally significant waste-oil regeneration capacity. However, the provision of such capacity has been adopted as a primary (long-range) goal for waste-oil processing.

Other types of wastes whose utilization could be made more efficient include plastics, rubber (tires) and glass. However, the obstacles to this include conventional economic considerations, such as high collection and transport costs, and industry's strict demands regarding quality (especially in the cases of plastic and glass). Glass collection has been arranged in about 40 municipalities (mainly near glass factories). The economic preconditions for particularly large-scale operations of this kind do not exist, largely due to the long transport distances involved and the fact that there is a highly efficient return bottle system in operation in Finland (see 6.4). Indeed, collection of waste glass as such is clearly on a lower level than in most other European countries. Nevertheless efforts will be made to expand separate collection of waste glass, something that will probably require municipal funding, especially to provide suitable containers. Recovery of packaging and comparable plastic wastes by the commercial and industrial sectors has increased somewhat in recent years.

Gypsum from the fertilizers industry, ferrous sulphate from the pigment (TiO_2) industry and many hazardous industrial substances are wastes whose utilization rates are low or do not virtually exist, nor is any substantial increase in sight. The aim in their respect is to reduce the quantities involved primarily by altering process inputs and configurations.

The utilization of wastes has developed to its present level mainly under the guidance of market forces and without supportive measures or regulations on the part of the public authorities. The influence of public guidance on the development that has occurred has been mainly indirect in character. Grants for research, product development, the use of wastes in energy production and their transportation as well as interest subsidies for investments to enable wastes to be recycled or otherwise reused have strengthened the positive development that has been recorded in recent years. The main effect of this support has been on recycling iron and steel scrap and timber wastes as well as on exploiting the calorific contents of wastes.

The most important obstacles to more widespread utilization of wastes are usually economic. An indispensable precondition for utilization is that the activity be sufficiently economic, something that is not easy to achieve within existing price structures. In some cases, the technology required has not yet been developed to the extent that would make the

utilization of wastes an economic proposition. Impurities in wastes often make them difficult to use. In Finland, the quantities of wastes produced are often small and scattered, which can be an obstacle to the construction of profitable processing capacity and cause excessively high collection and transport costs. In some cases, negative attitudes have prevented the utilization of wastes and the marketing of products made from them. The underdevelopment of the domestic market for wastes as raw materials and obstacles stemming from foreign trade have likewise prevented the utilization rate from rising. Further preventive factors have been a lack of knowledge and certain legislative drawbacks, mainly associated with turnover tax regulations.

The degree to which wastes are utilized in the future will depend decisively on the development of raw material and energy prices, the standard of waste management and the development of the costs involved in this as well as on the development of utilization technology and methods.

In July 1986 the Government made a decision-in-principle on implementation of a programme to promote the utilization of wastes. The programme was drafted by the Ministry of the Environment and its general aims are in priority order: reduction of the amount of wastes generated, promotion of the utilization of wastes, and final disposal which does not cause harm to the environment. A further intention is to develop legal, economic and other instruments of guidance. The following actions are considered:

- a further tightening up of implementation of the Waste Management Act.
- the enlargement of responsibility for waste management to production planning and product design (economical technology, reducing the amount of wastes, restrictions on the use of dangerous products, and so on);
- the development of financial incentives (grants to promote research and development as well as experimental project, investment subsidies for recycling investments, interest subsidies and the development of the transport subsidies the use of tax policy instruments);
- the creation of financing systems to reduce waste amounts and to aid the utilization of wastes (the share of public financing, the use of charges and tax policy as promotive financial incentives, funds and deposits in special cases);
- the development of training, public enlightenment and information.

19.2 Legislation and administration in the field of waste management

19.2.1 The Waste Management Act

The Waste Management Act entered into force in 1979 and an Amendment, which contained more precise regulations on hazardous wastes, in 1981. Prior to that, waste management was mainly regulated under the Public Health Act.

Application and main principles

The Waste Management Act applies to community wastes, industrial wastes and those generated in the course of other production as well as hazardous wastes. The Act does not apply to radioactive wastes nor to the management of waste explosives, which are covered by other legislation.

The main principle of the Act is stated in its 2nd Section: "To the extent possible, waste management is to be executed in such a manner that wastes can be recycled or otherwise re-used and that they are not detrimental to the environment."

This principle is binding and applies to everybody who produces or treats wastes. By "to the extent possible" is mainly meant to the degree permitted by the financial, technical and organizational means available in each particular case. Whenever these possibilities exist, wastes must be used to economic advantage. According to the latter part of the regulation, wastes must not cause harm to the environment.

In granting approval for statutory waste management plans, Provincial Offices have, among other things, imposed regulations requiring the channelling of wastes to beneficial use and the exploration of means of doing this. The former type of obligation relates naturally to waste materials in whose cases the technical, financial and organizational preconditions for recycling or re-use already exist. Municipal environmental authorities, too, can make approval for waste management plans conditional on re-use and, among other things, can also require property managements to sort wastes. However, municipal waste management authorities have not yet exercised all of the powers conferred on them under the Waste Management Act. Nor have the recycling and re-use of wastes been accorded sufficient importance in the municipal implementation of waste management.

Administration

Overall direction and supervision of waste management are vested in the Ministry of the Environment. The regional direction and supervision are the responsibility of the Provincial Offices and the Water and Environment Districts. General responsibility for the arrangement and supervision of waste management is vested in municipalities.

Organization of waste management (collection, transport and processing)

Property owners or holders are required to arrange the collection, sorting and treatment of wastes produced on their properties.

In population centres, the municipal authorities are required to provide transport for wastes collected on properties, using either their own resources or outside contractors. Municipal Councils can also rule that transport can be arranged under contracts between appropriate entrepreneurs and property owners or holders.

The general rule is that municipalities must arrange for the reception and treatment of wastes from properties (including hazardous wastes from residential properties). For this purpose, a municipality must have at its disposal general facilities for waste treatment, such as public landfills, treatment plants, transfer stations and reception facilities for hazardous wastes.

However, the above-mentioned obligation to provide transport and treatment facilities does not apply to wastes from industrial and comparable establishments if their compositions not known, or if it is of such a character that they require exceptional processing, or if the wastes are hazardous. Nor are municipalities required to deal with wastes in quantities that can be deemed unreasonable in comparison with the quantities generally produced by properties in the municipality. In such cases, the owner or holder of the property is required to arrange treatment himself and must apply for the approval of a Waste Management Plan by the municipal environmental authorities or - in certain cases - the Provincial Office.

The Waste Management Act specifies the places to which wastes may be brought. These include general waste treatment facilities (municipal landfills or reception facilities for hazardous wastes, and so on) as well as facilities run in accordance with approved Waste Management Plans or for which Hazardous Waste Processing Permits have been granted. Wastes may also be delivered to places where they are recycled or otherwise re-used. Where hazardous wastes are concerned, a requirement in this case is that the facilities in question be covered by a Processing Permit or approved Management Plan. Wastes may also be exported for treatment. Before hazardous wastes can be exported (or imported), the Ministry of the Environment must be notified.

The obligations and responsibilities of the various parties (producers, property owners or holders, those who provide transport, exporters or importers) involved with hazardous wastes are precisely stipulated in the Act. The main responsibility for appropriately arranging the management of hazardous wastes resides with the party which produces them. This responsibility is transferred to the party which treats the wastes only when they have been received at a treatment plant which has been given the approval referred to above.

Procedures for planning, permits and official notifications

Waste Management Plans

When a property owner or holder is required to arrange for waste processing himself and hazardous wastes or wastes of otherwise unusual character or in exceptional quantities are produced or treated on the property, he must provide the waste management authorities (municipal or provincial) with a Waste Management Plan. In other cases, too, the authorities can always demand the submission of such a Plan.

In approving a Plan, the authorities can impose conditions requiring recycling or re-use or any other measures considered necessary from the viewpoint of environmental protection.

This procedure has two main purposes: it imposes a statutory obligation on the property owner or holder to plan waste management thoroughly and in a manner meeting the requirements of the Act, in addition to which it constitutes a documentary aid to the authorities responsible for ensuring implementation of the Act.

A Waste Management Plan must cover a property's waste management operation in full, and not only that part covered by a statutory obligation to file a Plan. As an administrative device, the procedure involved virtually amounts to a licensing system, in which the authorities appraise the proposed Plan and approve it as such, impose conditions for approval, or reject it.

The number of properties required to submit Waste Management Plans is estimated at about 22,000. In practice, nearly all industrial establishments, mines, thermal power stations, hospitals, laboratories, transport depots, service stations and, in some cases, farms are required to submit Plans.

Hazardous Waste Processing Permits

With the exceptions mentioned below, Hazardous Waste Processing Permits must be obtained from the Provincial Office. The purpose of these permits is to ensure that hazardous wastes are processed safely and appropriately. A further intention is to channel processing in such a way that it meets national requirements as well as possible. The Processing Permit can be restricted to apply to certain types of wastes only. Any conditions considered necessary can be attached to it and it can be for a period of predetermined length.

The requirement to obtain a Processing Permit has not been extended to establishments which themselves have the capability to process wastes produced in the course of their operations. Such establishments may also receive and process wastes produced elsewhere if this processing constitutes only a slight proportion of the hazardous wastes or comparable substances of their own which they handle. Such processing of hazardous wastes without a Processing Permit is supervised by means of Waste Management Plans. Hazardous wastes may also be pre-processed without a permit at a public reception facility (a municipal reception facility for oil and other hazardous wastes).

The conditions for obtaining a Processing Permit are quite strict. A Permit is granted on the condition that:

- processing is considered necessary and purposeful from the viewpoints of the public interest and the national development of hazardous wastes processing;
- the way in which the hazardous wastes are processed meets the requirements of environmental protection;

- the applicant possesses the requisite expertise;
- the applicant is solvent and posts an adequate security;
- the applicant pledges to participate, if necessary, in the arrangement of regional collection services for hazardous wastes.

A Hazardous Waste Processing Permit is required by, among others, industrial establishments which receive hazardous wastes produced elsewhere (also as raw materials or fuels), properties which burn waste oil and landfills where hazardous wastes are processed. It is estimated that about 300 facilities (excluding landfills) are required to have these permits. Most of them are smallish oil-fired heating plants which burn waste oil. In practice, Processing Permits have not been granted for such plants, nor for dumps.

According to the Waste Management Act the Council of State can order a product or waste to be labeled as hazardous, or it can restrict or prohibit its manufacturing, import or use. The Air Pollution Control Act prohibits as of 1987 the import or delivery of oil-consisting waste as a fuel to power plants with efficiency less than 5 MW. Such waste can be delivered to larger power plants but even then a notification to the public authorities is required.

Notifications of imports and exports of hazardous wastes

Notification that hazardous wastes are to be imported, exported or transferred through the Finnish territory must be made to the Ministry of the Environment 60 days beforehand. The Ministry has the power to prohibit importation or exportation if there are substantiated grounds for the suspicion that the wastes will not be transported and processed in an acceptable fashion or the transport is not in accordance with a binding international agreement. This can also be done in case the importing country or the transit-country opposes the transport, or the import or export is not in accordance with the national waste management policy or it is otherwise detrimental or inappropriate from the view of the public interest. If permission is granted for exports, this is also notified to the appropriate authorities in the country of destination.

19.2.2 Other instruments of guidance

According to the 1975 Vehicle Junks Act, the aim must be to recycle or otherwise re-use scrapped vehicles or their parts. A vehicle's last owner and, in the final instance, the municipality must ensure that a scrapped vehicle is sent for appropriate processing. Since the Act entered into force, there has been success in increasing the numbers of vehicles re-used as raw material, not least due to collection campaigns organized by municipalities.

In order to promote waste management and the re-use of wastes, it has also been considered necessary to develop economic incentives.

Since 1983, interest subsidies have been granted for waste-recovery projects conducted by industry and municipalities. The level of these

subsidies is set each year in conjunction with approval of the national budget and has been 3-4%for the first four years of the repayment period on a loan granted by a financial institution and 1.5-2%for the following four years (the rate of interest charged by a financial institution is currently a maximum of 10%). In practice, interest subsidies have been granted to companies which collect and sort wastes (such as paper, metal, glass and plastic) as well as for certain large industrial projects (two de-inking plants, a secondary aluminum smelter). At the present level, the incentive value of loans at subsidized interest rates is relatively little (in all 1 - 2 million finnmarks per year). A similar interest subsidy system has been used to support municipal efforts to improve public facilities where wastes are treated (e.g. landfills).

From the beginning of 1987 the Ministry of the Environment has subsidized municipal recycling investments and industrial development and experiment projects (e.g. pilot projects). The total subsidy can be about to 20% of the total investment costs and the subsidy for industrial projects to 50% of total costs.

From the beginning of 1987 the importers and manufactures (or mixers) of lubrication oils have been levied a charge of 150 finnmarks per ton of oil. The fund thus accruing (about 16 million finnmarks per year) are used by the Ministry of the Environment to subsidize for the proper storage, collection, transport and treatment of waste oil and other oil wastes.

The Ministry of the Environment has a small appropriation for assisting with waste management arrangements in the fjell and archipelago areas.

The Ministry of Trade and Industry has also provided investment grants and interest subsidies in support of certain projects aimed at exploiting the energy content of wastes as part of its programme to promote indigenous fuels. In addition to that, the Mortgage Bank of Finland (a subsidiary of the Central Bank) has granted environmental protection loans on soft terms to assist some largish industrial investment projects involving the use of wastes.

Rail freight discounts (amounting to 5.6 million finnmarks in 1983) are granted on certain waste materials (vehicle junks and other metal scrap, paper, glass, textile wastes) being sent for re-processing. Most of this support is for consignments of metal scrap. Subsidies, totalling about 4 million finnmarks a year, are also granted for transporting timber wastes (sawdust and chips). Regional transport subsidies have been made available for road haulage of granulated, pelleted and other types of steelworks slag.

During its inaugural stage, the Ekokem Oy Ab's processing facility for hazardous wastes received direct Government grants (including the equity share) of 31.6 million finnmarks, in addition to 20 million finnmarks in turnover tax reductions). The Ekokem facility also receives 45 million finnmarks over its first three years of operation (1985-87) to cover its capital costs. The Ministry of the Environment pays the facility an annual transport subsidy of just over 3 million finnmarks. This is intended to make transport costs equal regardless of the distance the wastes are brought.

The State budget for 1987 contains an appropriation of 2.6 million finnmarks, which the Ministry of the Environment uses to provide grants for research intended to promote waste management and the recycling of wastes. Research has also been financed by other ministries, national boards, universities, research establishments, foundations and organizations as well as, naturally, by industry.

19.3 Management of nuclear wastes

Nuclear power production has already been discussed in chapter 5. This chapter will only deal with the principles of nuclear waste management.

There are four nuclear power plants in Finland located as two separate units in two localities. One of these units exports the used fuel back to its original deliverer while the other has to be prepared to handle or store the fuel in Finland. Table 48 shows the capacity of the units and the share of nuclear power. No decisions have yet been made on the planned 1,000 MW unit. A gap of base load electricity production is expected to arise by the mid-1990s. Whether it will be covered by nuclear or by some conventional fuel or even by any combination of them will be decided later. The recent accident in the Chernobyl nuclear power plant is likely to postpone this decision.

Table 48. Nuclear power production in 1985.

Nuclear capacity	Units - Net GWe
Connected to the grid	4 2,3
Under construction	- -
Planned	1 1
Electricity's share of total primary energy	41%
Nuclear power's share of electricity	34%

For two out of the four nuclear power plants the fuel is delivered from the USSR as fabricated fuel assemblies on the basis of long term contracts. For the other two plants the fuelling scenario is manifold and involves supplies of material and various services from several countries. For the time being the main suppliers of natural uranium are Canada and Australia. The uranium is converted either in Canada or France, and enriched in the USSR. Fuel element fabrication services are provided by firms in Sweden and the Federal Republic of Germany. The depleted uranium has been placed to a number of countries. This multibase arrangement requires the a network of bilateral governmental agreements.

There exists no plans for domestic uranium production, enrichment or fuel fabrication.

A Waste Management Plan has to be made and approved by the public authorities for low-active and medium-active as well as the decommissioning waste of nuclear power plants. The ultimate disposal of these wastes will take place at the site of the nuclear power plant by placing them deep in the bedrock.

An estimate has been made in 1982 that the total amount of low and medium-active waste as well as decommissioning waste will be about 27,000 m^3 in one unit (Loviisa) and about 42,000 m^3 in the other power unit (Olkiluoto). The share of decommissioning waste in these will be 20,000 m^3 and 26,500 m^3. By the end of 1985 altogether 980 m^3 of waste had been generated in Loviisa and 970 m^3 in Olkiluoto.

Spent fuel is stored for both units at site in wet storages. Fuel delivered by the USSR will be send back after a cooling period of approximately five years. Fuel delivered on multibase arrangements are presently stored in large wet storages on an interim basis. According to a decision-in-principle adopted by the Government in November, 1983 the utility companies are required to seek the use of larger international waste repositories. Pending this solution the utilities have, however, to prepare themselves for final disposal in Finnish bedrock.

In making preparations for final disposal, the basic assumption is that spent fuel removed from a reactor is stored until disposal to be commenced from about the year 2020. The planning of the final disposal of spent fuel is to proceed in such a way that one suitable site will be selected by the end of the year 2000. A detailed schedule for successive targets is as follows:

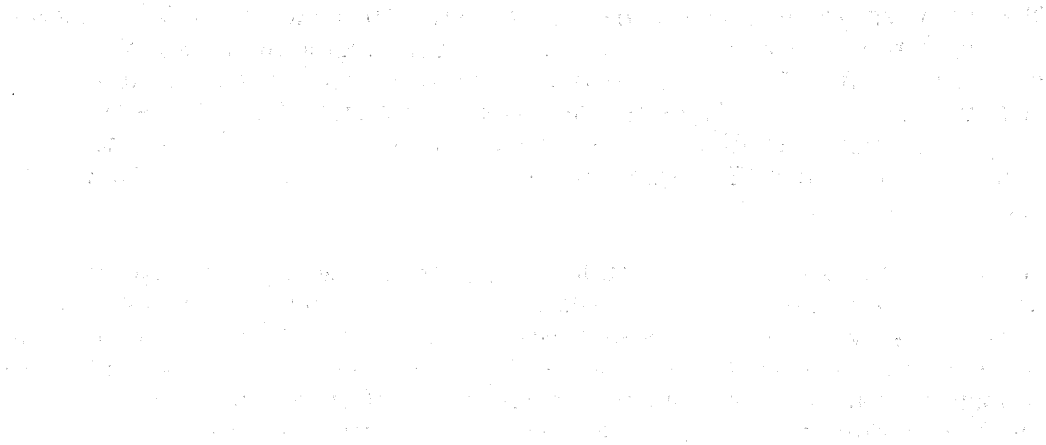
- By the end of 1985 a number of feasible areas were to be proposed on the basis of geological and other relevant scientific information. By the same date the technical plans relating to disposal of spent fuel were to be complemented and updated;
- By the end of 1992 the preliminary site investigations must be performed in these areas to single out the most appropriate sites for detailed investigations;
- By the year 2000 detailed site investigations have to be carried out and one particular site be named;
- By the year 2010 the licensees shall be prepared to submit to the regulatory authorities the designs of the repository and the encapsulation facility, on the basis of which the construction licenses can be granted.

Several municipalities have opposed against preliminary site investigations in their area and no such investigations have so far been started.

The utilities generating nuclear waste have to make financial reservations to cover the future waste management costs including those of decommissioning. For the time being the reserves are based on the assumption of direct disposal. The waste producers have to bear the responsibilities regarding the costs as well as the practical waste handling operations. The government has required guarantees to cover the financial liabilities.

It has to be assumed that conditioning, storage and final disposal of low and medium-active waste will take place in Finland. By the end of 1986 the necessary plans with safety assessments concerning the construction of repositories were to be submitted to the regulatory authorities. The repositories have to be ready for operation, if necessary, by the end of 1992. Preparatory work is under way on the reactor sites.

The licensees also have to maintain a decommissioning plan. It must be submitted to the authorities for review at five years intervals. Next report shall be furnished by the end of 1987.



20 CONTROL OF CHEMICALS

20.1 Chemical industry in Finland

20.1.1 Background

The Finnish chemical industry is very young, but throughout its short history it has had strong ties with both agriculture and the forest products industries.

In the limited sectors where the Finnish chemical industry has chosen to specialize, it has achieved a high level of technological and managerial expertise, supplemented more recently by experience on the world market. Thus, the chemical industry has developed into one of the country's most important industrial sectors. With its 16% share of the gross value of industrial output, it ranks fourth after the forest products, metal and machinery and food industries. These four sectors together account for 92% of the total industrial output.

There are 200-300 enterprises engaged in chemical manufacturing in Finland, but many of them operate on a small scale. About thirty are of medium size by Finnish standards, some even by international standards, and form the backbone of this industrial sector. As a result of the great need for capital, the Government has played a rather important role in the chemical industries, acting as a share-holder in a few enterprises, especially in the field of heavy basic production; only a very small proportion of the Finnish chemical industry depends on foreign capital.

20.1.2 Production

The gross value of production of the Finnish chemical industry amounted to 26.126 million finnmarks in 1986 and its value added to 8.991 million finnmarks (oil refining and manufacture of plastic and rubber articles are included).

The industrial chemicals group, accounting for nearly 40 per cent of total production value, consists of industrial chemicals, fertilizers and pesticides, and plastic raw materials and fibres.

Production of inorganic industrial chemicals includes such basic products as chlorine and alkali (sodium hydroxide) together with sodium chlorate and hypochlorites, ammonia, nitric acid, sulphuric acid, sulphuric dioxide, phosphoric acid, calcium chloride, atmospheric gases, various sulphates, and two important oxides, i.e. titanium dioxide and vanadium pentoxide. In addition, a great variety of inorganic chemicals are produced in smaller quantities.

The main organic industrial chemicals are ethylene, propylene, butadiene, benzene, phenol and acetone.

Production of fertilizers is one of the oldest branches of the chemical industry, and it has undergone some far-reaching in recent years. With

the beginning of domestic apatite mining at the end of 1979, fertilizers as finished products have begun to correspond better to the material base.

Table 49. Gross value of production.

	Gross value of production, Million FIM					
	1981	1982	1983	1984	1985	1986[1)]
Manufacture of industrial chemicals	7,983	7,995	8,985	10,454	10,977	10,230
Manufacture of other chemical products	3,608	3,280	3,592	3,835	4,194	4,313
Refining and manufacture of petroleum and coal products	14,438	14,089	15,598	15,715	16,492	8,280
Manufacture of rubber articles	772	806	835	871	936	1,031
Manufacture of plastic articles	1,375	1,605	2,033	2,010	2,300	2,272
Total	28,186	27,475	32,885	34,885	34,899	26,126

1) Preliminary statistics

Typical products of the Finnish chemical industry are those based on cellulose such as carboxymethyl cellulose and viscose fibre, and by-products of the wood-processing industries such as tall oil and turpentine derivatives.

Oil refining was started nearly 30 years ago. The present refining capacity is 12 million tonnes a year. Production of plastics first became important in the chemical industry in 1972, when both a low density polyethylene plant and a polyvinyl chloride plant started operation. Apart from these major products, a many of other plastic materials are produced, including alkydes, polyesters, polystyrene, polyvinyl acetates and acrylates.

Table 50. Production of some chemical products in Finland in January 1980.

	Tons
Crude oil refining capacity	12,000,000
Compound fertilizers	1,500,000
Nitrogenous fertilizers	320,000
Sulphuric acid	1,350,000
Nitric acid	580,000
Phosphoric acid	260,000
Ammonia	85,000
Formic acid	23,000
Chlorine	300,000
Sodium hydroxide	340,000
Sodium chlorate	100,000
LDPE	175,000
PVC	60,000
Polystyrene	32,000
Phenol	50,000
Acetone	30,000
Benzene	110,000
Butadiene	20,000
Propene	90,000
Phtalic anhydride	20,000
Plasticizers	10,000
Unsaturated polyester resins	
Tall oil refining capacity	140,000
Turpentine refining capacity	15,000
Titanium dioxide	80,000
Synthetic fibres	65,000
Paints and varnishes	120,000
Soap and detergents	100,000
Cosmetics and toiletries	400 million marks
Pharmaceutical products	1,000 million marks

There are 12 companies in the pharmaceutical industry. Their share of the domestic market amounts to 58 per cent. In addition to pharmaceutical specialties, an increasing number of pharmaceutical fine chemicals are produced by several companies.

Roughly a dozen companies produce paints, varnishes and printing inks. Some of the paint industry companies have extensive export activities and they have also developed advanced production techniques and outstanding tinting systems.

Cosmetics, detergents, and a wide range of other chemical household products are made in Finland by a large number of enterprises, most of which are, however, fairly small.

20.1.3 Foreign trade

The chemical industry was originally established in Finland to meet the requirements of the domestic market, and especially those of agriculture and the forest products industries. As late as in the 1950s, when oil refining also got under way, production was still primarily concerned with satisfying domestic needs.

It was not until the 1960s that the chemical industry developed into an independent and multifarious branch of industry, aiming not only to refine domestic raw materials to the highest degree possible but also to develop production based upon imported raw-materials, whenever justified on technological and commercial grounds. Some chemical industry products, such as titanium dioxide and viscose fibre, were exported but still in the middle of the 1960s, they accounted only for some 2-3% and ten years later for 6% of total Finnish exports. The chemical industry's contribution to Finnish exports reached its peak so far in 1984 when it was 12.3%. The latest (1986) figure is 9.5%.

In 1986 the value of chemical industry exports amounted to 7,595 million finnmarks. The main markets were the EFTA and the EC countries, and exports to these two amounted nearly 70 per cent in 1984. The remaining 30 per cent share was divided almost equally between the European planned-economy (CMEA) countries and non-European countries. The Finnish chemical industry has been increasingly active on markets outside Europe, as is seen in the growing share of non-European countries in its exports. The distribution of chemical industry exports between various groups of countries varies considerably from one group of products to the other.

20.1.4 Future developments

As a small country Finland cannot engage in basic research to the same extent as larger industrial countries. This means that the initial technology for many basic processes has to be purchased abroad. Nevertheless, Finnish industry has acquired considerable experience in the application of technology, enabling it to develop new and original processes, some of which have been applied in fields different from those for which they were developed.

There is still scope for further growth in the Finnish chemical industry. Exports can be further expanded, as the majority of present export products have only recently been launched on the world market. The opportunities for growth will also depend on the results of intensive research work. This is being conducted in selected fields, some of which involve developing technology for the use of domestic raw materials in the chemical industry, whereas others entail the production of special chemicals or other products of higher value. A number of acquisitions have recently been made abroad to broaden the field of activities of several chemical industry companies.

20.2 Use of pesticides

Pesticides are used relatively sparingly in Finland since there is no great necessity for using insecticides and fungicides. Most of the pesticides employed are herbicides, in particular the phenoxyacetic acid herbicides MCPA and 2,4-D.

In 1986 there were 232 pesticide products, including insect repellents, on the market. The number of active ingredients in products totalled 135. There were 19 domestic suppliers of herbicides.

Sales of pesticides in 1986 totalled 4,500 tonnes, of which the active ingredients comprised 1,950 tonnes. The volume sold was of the same order as 1985. The monetary value of the sales was 213 million finnmarks, this being slightly higher than the previous year.

The largest group of pesticides sold and used consisted of herbicides for agriculture. These represented 65% of the total pesticides, 79% of the active ingredients, and 66% of the monetary value. The amount of field herbicides sold was sufficient to treat 10,36,700 hectares, equivalent to 87% of the total cereal acreage in 1986.

Table 51. Summary of the volume of pesticide sales in 1986.

Pesticides	Sales, tonnes	Active ingredients, tonnes
Fungicides	538	110
Agricultural insecticides, etc.	349	140
Other insecticides, etc.	404	7.5
Insect repellents	53.1	10
Agricultural herbicides	2,900	1,530
Forest pesticides	146	69
Growth regulators	113	23.5
	4,803	1,890

Sales of agricultural insecticides totalled 349 tonnes, of which 140 tonnes were active ingredients. This amount was sufficient for a single treatment of 253,000 hectares, or 11% of the total field acreage under cultivation in 1986.

Altogether 538 tonnes of fungicides were sold in 1986. The amount of active ingredients was 110 tonnes. Of the amount of fungicides sold, 59% consisted of seed treatment products containing alkoxy-alky mercury compounds as the active ingredient. In 1986 some 634,000 hectares, or 53% of the total cereal area was sown with treated seeds.

As in previous years, forestry pesticides were used in small quantities. The sales of 146 tonnes - active ingredients 69 tonnes - represented only about 3% of the total sales volume. The glyphosphate used in forestry is not, however, included in these figures.

20.3 Risks involved in the chemicals manufactured and used

Some of the industrial chemicals produced and used on a large scale are toxic, corrosive or otherwise of a hazardous nature. Dangerous substances include acids and alkalis such as sulphuric acid, nitric acid and phosphoric acid, and sodium hydroxide. Toxic gases in extensive use include chlorine, sulphur dioxide and ammonia. Other noteworthy dangerous substances are vinyl chloride, benzene, phenol and carbon disulphide.

Environmental problems associated with the production and utilization of chemicals are associated on the one hand with a few large chemical plants and on the other with the huge volumes of chemicals used by the chemical wood-processing industry. The emissions of the sulphuric acid and fertilizer factories have been reduced. Discharges into water bodies from the Kemira Oy titanium dioxide plant at Pori are currently smaller than in other plants abroad where titanium dioxide is produced using the sulphur acid process. The recipient, however, is the Gulf of Bothnia which is highly vulnerable and thus still poses problems from the environmental point of view. Production plants of the petrochemicals industry are a relative newcomer, and the current environmental protection requirements have been taken into consideration in this planning, particularly those regarding the marine (the Baltic Sea) environment.

20.4 Control of chemicals

20.4.1 Legislation on chemicals

The focal points of legislation applying to chemicals are the Poisons (Toxic Substances) Act of 1969 and the Labour Protection Act of 1958, both of which have regulations concerning the classification and labelling of hazardous chemicals. The Explosive Substances Act also forms part of this legislation. Specific legislation exists for certain groups of chemicals, such as pharmaceuticals, pesticides, fertilizers, explosives, food additives and cosmetics. The primary purpose of legislation applying to chemicals is the protection of human health, although the importance of environmental protection is increasing steadily.

The Poison Act follows traditional European poison legislation and applies to substances hazardous to health. The regulations concerning classification and labelling were revised in 1980. The Poisons Act includes provisions, for the following:

- registration of wood preservatives;
- regulations applying to permits for the manufacture and sale of substances hazardous to health;
- regulations applying to the handling and storage of substances hazardous to health;
- limitations regarding the distribution of toxic substances for general consumption, and special regulations applying to the sale of concentrated sodium hydroxide and narcotic solvents.

The amendments made to the Labour Protection Act in 1976 made it possible to increase control of the dangerous substances used in work. More specific regulations are incorporated in the Council of State Decision of 1978 concerning the identification and labelling of substances harmful to health. The provisions of the clause pertain to:

- an overall classification and labelling system for hazardous substances; and
- mandatory material safety data sheets of dangerous chemicals in use at work.

In conjunction with the Labour Protection Act a Council of State Decision has also been made on carcinogenic substances. This Decision is based on the equivalent General Agreement no. 138 of the International Labour Organization (ILO). The list of carcinogenic substances is also linked with a classification and labelling system and with the Poisons Act. Furthermore, the Labour Protection Act also contains special regulations applying to certain chemicals such as benzene, lead and asbestos, and recommendation of permissible levels of occupational exposure to harmful agents.

The classification and labelling system stipulated by the Labour Protection Act and the Poisons Act is an application of the Council and the Commission of European Communities Directives on the classification, packaging and labelling of dangerous substances, in particular Directive 67/548/EEC and its Sixth Amendment, and Directive 79/83/EEC. The list of dangerous substances follows that of Annex I to Directive 79/83/EEC. In Finland there are, however, separate lists for:

- allergenic substances; and
- carcinogenic substances.

The responsibility for labelling applies not only to substances but also to chemical products. Binding stipulations have been issued for the classification of mixtures only in the case of paints. Instructions have been issued for the classification of other mixtures on the basis of concentration limits. In addition, an inflammable liquid must always be labelled with a warning symbol.

Legislation applying to explosive substances incorporates stipulations in respect of:

- explosives;
- inflammable liquids;
- liquid gas; and
- natural gas.

The primary objective of legislation concerning explosive substances is the control of safety in the manufacturing, storage and use of such substances. A manufacturing licence for toxic chemicals as described in the Poisons Act has in recent years acquired the form of a safety permit, the aim being to avoid major accidents in hazardous installations.

Chemicals used in agriculture and forestry are under preventive control in accordance with special Acts applying to them. For fertilizers and animal feed additives, there is a notification procedure the purpose of which is to ensure their suitability and safety, i.e. that they are effective and that their utilization does not constitute a hazard to human health, the environment, plants under cultivation or domestic animals.

Legislation concerning the control and approval of pesticides were revised in 1983. Before a new pesticide is approved, its efficacy and suitability are studied in this country by means of field experiments. Specialist authorities evaluate the possible hazards of the substance to the health of workers and the public, as well as to the environment in general.

Food legislation and the legislation on consumer protection contain both general stipulations on preventing hazards to health caused by consumer products, and special stipulations relating to certain consumer chemicals. There are also some special regulations, for example, those applying to cosmetics. The decision on the harmful substances contained in cosmetics is currently being revised to comply with the relevant EC Directive (76/768/EEC). Special regulations also exist for detergents and cleaning agents. There are no special stipulations regarding the maximum phosphorus content of detergents, but the industry has voluntarily adopted the recommendations issued by public authorities.

Radioactive materials come within the scope of the Radiation Protect Act. In accordance with the Act all handling of radioactive materials requires a special safety licence.

The transport of dangerous goods by road, rail, air or sea is provided for in detailed regulations based on international agreements and recommendations (RID, ADR, IMDG, ICAO).

The control of chemicals is closely connected with certain control procedures included in the environmental protection legislation. Regulations applying to chemical wastes are incorporated in waste management legislation, which includes special stipulations regarding the treatment of toxic and hazardous wastes (see chapter 11.5). The Waters Act incorporates special regulations for substances that are particularly hazardous to the aquatic environment.

20.4.2 Supervision of the stipulations in the Chemicals Act

Responsibility for supervising the regulations of the chemicals legislation lies with several ministries and in practice with several different National Boards. The regional and local supervision of chemicals is therefore the responsibility of various public authorities.

The highest public authority with respect to the supervision and control of the Poison Act is the Ministry of Social Affairs and Health and the National Board of Health subordinate to it. Supervision of industrial manufacturing and handling of dangerous substances is the responsibility of the Ministry of Trade and Industry and its subordinate, the Technical Inspection Centre.

It is the duty of the Ministry of Social Affairs and Health and its subordinate, the National Board of Labour Protection, to supervise the regulations and stipulations applying to chemicals contained in and provided for by the Labour Protection Act.

Legislation applying to agricultural chemicals is the responsibility of the Ministry of Agriculture and Forestry. Approval for pesticides is granted by a Pesticides Committee made up of representatives from several central Government authorities. The National Board of Agriculture is responsible for supervising the use of pesticides. Animal feed and fertilizers are supervised by the State Institute of Agricultural Chemistry.

Consumer chemicals are supervised by the National Board of Trade and Consumer Interest, which is subordinate to the Ministry of Trade and Industry. However, the National Board of Health is responsible for assessing the health hazards of these chemicals.

Cooperative bodies have been established in order to draw together the various components of government organization; the main one is an Advisory Committee on Toxic Substances. The Committee consists of representatives from all the ministries and National Boards involved in chemicals control.

None of the ministries or National Boards have one single unit - department or office - exclusively for the control of chemicals. Several of the authorities mentioned above employ 2-5 persons who are primarily involved in chemicals control.

Expertise on the harmful effects of chemicals on health and the environment needed by the administration exists at three research institutes and at universities. The Institute of Occupational Health, which is sub-ordinate to the Ministry of Social Affairs and Health, possesses expertise in both occupational medicine and industrial toxicology. The National Public Health Institute, which has expertise in the fields of epidemiology, environmental hygiene and toxicology, is subordinate to the Ministry. The Water and Environment Research Institute, within the National Board of Waters and the Environment, possesses expertise on certain aspects of the environmental effects of chemicals.

A scientific advisory council in conjunction with the Ministry of Social Affairs and Health for assessing the harmful effects of chemicals on health.

20.4.3 Key issues in the control of chemicals

The Council of State considered the key issues in chemicals control when presenting Parliament with three reports: on Health Policy (1985), on Science and Technology Policies (1985) and on Environmental Protection (1984). In addition, chemicals control has been examined in conjunction with Council of State's decision-in-principle on the National Working Environment Programme.

The following aspects of chemicals control are crucial for their present and future implications:

- control of carcinogenic substances as a part of general regulations concerning factors which can cause cancer;
- control of allergenic substances as a part of general regulations concerning factors which can cause allergy;
- registration of installations liable to cause major accidents and the development of control measures regarding them.

Attention has been paid, or is to be paid, to the following specific substances and groups of substances:

- cadmium - its use, release into the environment and occurrence, exposure to it, and the risk to humans and the environment caused by it;
- PCBs - their use, special risks of fire and possibilities for stricter control;
- formaldehyde - use, exposure and major risks;
- use of chlorofluorohydrocarbons in aerosols, plastic foams, refrigeration equipment and as a solvent;

- principles for classification of substances hazardous to the environment;
- re-evaluation of the old pesticides on humans and the environment.

An ad hoc Committee of experts published a report in 1983 on cancer and its causes. The report also includes recommendations for legislation on carcinogenic substances. A similar report on allergenic substances, which also embodied detailed recommendations, was published in 1982 by another Committee. Procedural recommendations for preventing environmental damage by cadmium and for reducing exposure to it appeared in 1982.

In these particular sectors, as well as in other fields of chemicals control, the Finnish public authorities work in close cooperation with the other Nordic countries in the form of several permanent and ad hoc groups under the Nordic Council of Ministers.

20.5 Improving legislation on chemicals

Preparation of a general Chemicals Act to replace the current Poisons Act has been under way since the late 1970s. An ad hoc Committee for Product Control dealt with the matter in the period 1979-1982. A proposal for a new Chemicals Act was included in the Committee's report. The Committee considered Finland's then current legislation on chemicals to be inadequate in with that in other industrialized countries, particularly because:

- the legislation lacks regulations on control of new substances;
- the Poisons Act does not apply to substances dangerous to the environment and does not include enough measures to control environmental risks of toxic chemicals;
- there is limited scope for controlling chemicals not yet classified as toxic or harmful

The Chemicals Act is being prepared by the ad hoc Committee for the Chemicals Act, which was charged with producing a draft bill by 30.4.1986. When setting up the Committee for the Chemicals Act, the Council of State took a stand on certain fundamental matters. The enactment will, be divided between three different ministries:

- the Ministry of Social Affairs and Health will be responsible for matters concerning toxic chemicals and the health hazards of chemicals;
- the Ministry of the Environment will be responsible for matters concerning the impact of chemicals on the environment;

- the Ministry of Trade and Industry will be responsible for matters concerning technical safety in the production of chemicals and in their industrial use and handling.

In the light of the proposal made by the Committee for the Chemicals Act, the new Chemicals Act and the relevant statutes would:

- seek to prevent harmful effects to man and the environment from chemicals; the Act would apply to chemicals generally, although certain groups of chemicals for which there exists special legislation, e.g. pharmaceuticals, pesticides, food additives and explosives, would remain outside the scope of the Act either partially or wholly;
- emphasize the manufacturers' and importers' responsibility in acquiring knowledge, as well as their duty to supply users of chemicals with information on the risks of chemicals and, when necessary, instructions concerning their safe use. A Material Safety Data Sheet will be used for this purpose;
- incorporate regulations for notifications of new substances, the intention being to prepare these as far as possible to comply with the relevant EC directives, with EINECS being used as a reference for existing chemicals;
- embody regulations on advance approval of wood preservatives and slimicides;
- include regulations concerning the classification and labelling of chemicals hazardous to humans, also the classification of substances hazardous to the environment;
- retain the regulations concerning the importation, trade, purchasing and possession of toxic chemicals;
- call for revision of regulations concerning permits and notification needed for the production, storage, use and handling of substances hazardous to humans and the environment as well as of inflammable liquids; they should be brought into line using as one of the references the Seveso directive of the European Communities (82/501/EEC);
- embody regulations on the supervision of laboratories testing chemicals;
- incorporate regulations concerning export notifications for banned and severely restricted chemicals.

21 NOISE ABATEMENT

21.1 Current situation

The factors that have contributed most to higher noise levels and the spread of noise are urbanization, changing lifestyles and transformation of the economic structure, which has brought a strongly growing volume of traffic in its train. To a constantly growing degree, noise has become a problem at all times of the year and everywhere. Neither community planning nor planning of working and living environments have adequately succeeded in preventing a deterioration in the situation regarding environmental noise. In the years in which urbanization proceeded at its liveliest pace, noise was not accorded sufficient attention in physical planning.

In Finland the noise situation has been explored by some municipalities and an initial assessment has been conducted in one province. But no nationwide studies on a uniform level of the extent of the noise situation have been conducted. There are calculations relating to areas exposed to aircraft noise and the numbers of people living in them. Since study methods vary so widely, it is difficult to compare their results with each other. A further drawback is that most of the studies were conducted in the 1970s. Thus assessments of the noise situation in Finland have to rely to a considerable extent on data from comparable countries. On that basis, it can be estimated that about 1.8 million people live in noise-blighted areas ($L_{Aeq} > 55$ dB) of Finland, which means that noise detracts from the quality of the living environment enjoyed by a substantial proportion (more than a third) of the national population.

21.2 Legislation concerning noise abatement

21.2.1 Noise Abatement Act

The parliament passed the Noise Abatement Bill in February 1987. The Act will come into force March 1, 1988.

Noise is defined in the Noise Abatement Act as being any sound that is detrimental to health or significantly reduces contentment or work efficiency. The Act also apply to vibration comparable to noise in its effects. The Act contains a definition of what functions are regarded as caused by noise. Noise abatement is defined as meaning measures taken to reduce emissions from a noise source, temporarily of spatially limiting activities that cause noise, limiting the spread of noise or protecting an object that is subjected to it.

The Act will vest the overall direction and supervision of noise abatement in the Ministry of the Environment. On the intermediate level, direction and supervision of noise abatement will be the responsibility of the Provincial Offices. Municipalities, in turn, will supervise, direct and promote noise abatement on the local level. The Act envisages the point of departure as being that municipal noise abatement tasks will be taken care of by the Environmental Protection Board.

Explicatory decrees will be promulgated on the basis of the Act to stipulate what expert authorities and institutions will perform noise abatement tasks. The Noise Abatement Act departs from the premise that the person causing noise has an obligation to remedy this to the degree that can reasonably be expected and that he is sufficiently aware of the effects of his activities. It also stipulates what aspects should be considering in assessing this obligation. It is also envisaged that officials will have a similar general responsibility to take noise-abatement-related aspects into consideration in the discharge of their duties and to maintain the necessary contact with the noise abatement authorities.

The council of State has important powers to regulate noise abatement in greater detail. Responsibility for preparatory work in this respect will be mainly vested in the Ministry of the Environment. The Council of State has empowered to promulgate general guidelines or regulations dealing with maximum permitted noise levels indoors and outdoors, maximum emission levels for equipment and vehicle manufactured, imported, sold or used and the noise-reducing adjustments that should be made to such equipment as well as measures to be taken to protect specific places from the effects of noise. The Council of State can promulgate general regulations prohibiting or limiting noise-producing activities or equipment at certain times of the day or night. It can also promulgate general guidelines on noise zones necessary for noise abatement purposes and their demarcation criteria as well as on the planning principles applicable to such zones.

According to the Act, the Ministry of the Environment can issue general regulations or guidelines dealing with metering or calculation methods used to establish noise levels or noise emissions as well as general instructions on certain other matters, mainly connected with the performance of the authorities' noise abatement tasks. The Ministry can also require or permit the use of markings indicating the noise caused by equipment manufactured, imported or sold.

It is the responsibility of the municipalities to follow the development of noise levels in their territories in order to obtain the requisite knowledge of local conditions. They should study noise levels to the extent that local conditions require. As soon as this study indicates the necessity, a municipality should prepare a noise abatement programme. The programme will serve as a guideline in planning and organizing land use and other functions in addition to other administrative actions in the municipality. Both the noise study and the noise abatement programme will have to be forwarded to the Provincial Office for purposes of notification.

The Noise Abatement Act provides for a special notification procedure to be followed in relation to certain temporary noise-producing functions and on the basis of which the municipal environmental protection board can order the necessary preventive measures. Such notification will be compulsory in relation to certain construction, repair and maintenance work, motor sport events and comparable entertainment events as well as on other occasions when the noise caused will be especially disturbing to people living or sojourning in the vicinity.

The Act contains regulations on such matters as the right of a municipal environmental protection authority to carry out the necessary

inspections to monitor the noise level as well as on the means of sanction and penalties necessary to enforce the Act.

21.2.2 Current legislation

Various pieces of legislation currently include regulations limiting the noise levels emitted by motor vehicles, aircraft and outboard motors and set requirements in relation to internal sound insulation in residential buildings and the sound levels permitted for equipment in those buildings. Emission standards have also been set for various mobile and stationery machines in order to ensure labour protection.

The Ministry of the Communications has issued regulations limiting noise emissions by motor vehicles. The underlying principle adopted is to observe the levels recommended in the ECE's regulation 51 as far as possible. In 1983, the Nordic Ministers of the Environment set a limit of 80 dBA as the general goal for all vehicles. The Finnish Ministry of the Communications has in 1986 implemented this target level with application to passenger cars. The standards for heavy vehicles are in Finland less stringent than in the other Nordic countries and the European Communities. Emission levels set by the International Civil Aviation Organization (ICAO) have been taken into consideration in planning aircraft noise limits.

At the moment, public health legislation provides the principal means of intervening in activities that cause noise. In principle, the Public Health Act permits the prevention of noise insofar as it causes a danger or disturbance to people's health. The health authorities are empowered to influence, among other things, the locations and layouts of various establishments and properties in such a way that forward planning of health-related requirements is also included.

A Directive sent by the National Board of Health to provincial and municipal health authorities in 1979 sets forth general guidelines concerning acceptable noise levels in various outdoor areas and indoors. The guidelines are based on those set forth in the World Health Organization's (WHO) Environmental Health Criteria series. However, the impact of the Directive has been lessened by its rather low status; a recommendation issued by a National Board to its subordinate bodies. It has also become obvious in several connections that in addition to general recommendations on noise levels there is a need for separate guidelines dealing with problems like aircraft noise as well as the location of shooting ranges, motor sports tracks, etc.

21.3 Goals of noise abatement

According to the Report on Environmental Protection given by the Government to Parliament in 1984 and according to the argumentation for the Noise Abatement Bill in 1986, the general goals of noise abatement are: a healthy and decent habitat undisturbed by noise, and ensuring that people have adequate opportunities to enjoy silence. There must be an effort to prevent the generation of new noise disturbances, for example when the environment is altered. A further goals is to improve the state of the existing built-up environment wherever there is a noise nuisance. There must also be sufficient recreational areas shielded from

noise. All deleterious effects of noise, i.e. not only its effects on hearing, are to be taken into consideration in noise abatement. Indeed, the goal is a much lower noise level than would be required merely to protect hearing.

In planning its goals and the means to be used in implementing noise abatement in Finland, the Ministry of the Environment has attached importance to the OECD's recommendations. One example of this is that, following established practice, these recommendations are referred to in the argumentation for the noise-abatement bill.

21.4 Means of implementing noise-abatement goals

The Polluter Pays Principle is the point of departure in planning noise abatement. The means available include limiting emissions at source, including geographical and temporal restrictions on the operation of equipment, land-use planning, prevention of noise dissemination, shielding, financial measures, public enlightenment and information. The means used in Finland to date consist mainly of emission norms for certain noisy machines and land-use planning. Other traditional means have either been used sparingly or their use is still in the planning stage.

The primary aim is to prevent noise by means of planning and design measures at source (machinery design, road layouts, structural design, surfacing, etc.) Here, the regulative instruments available are emission limits for various types of machinery and equipment. The goal in setting limits is to achieve constantly declining noise levels through technical improvements. The importance of limits is also accentuated by the fact that only through them can one lower noise levels in already built-up areas. This also provides the most appropriate means of reducing the nuisance caused by heavy traffic. Because heavy traffic has enjoyed a certain preferential status, in addition to which urban structures and the associated arterial networks are already in place, this aspect would be of particular importance in Finland.

Various temporal or geographical limitations on the use of some types of machinery and equipment also provide a useful source-oriented means of noise abatement. Existing legislation permits their use and examples of measures already implemented in this respect include local bans on motor-boats and off-road vehicles.

However, abatement measures directed at sources are not always successful in achieving the desired reductions in noise levels. In such cases, efforts are made to prevent noise spreading, e.g. by building baffles. More and more of those noise barriers are being built, especially in the Helsinki Metropolitan Region.

Land-use planning plays a central role in noise abatement. This applies to sources, preventing the spread of noise and protecting exposed areas. Most sources are such that suitable land-use planning is the easiest way of preventing noise problems. Attempts to take noise questions into consideration in physical planning have been meeting growing success. Manifestations of this include the noise situation reports that are now being included in planning documents and the acoustic insulation conditions that are being linked with planning permission.

In some cases, however, neither measures directed at sources nor those intended to prevent noise from spreading can achieve sufficient reduction. This can be the case in existing urban environments or places particularly sensitive to noise. Here, it is essential to supplement other noise-abatement efforts with protective measures, such as improving the acoustic insulation of buildings or making it more efficient than normal to start with. There are several examples of such measures having been implemented. Noise abatement itself is seldom the only reason for basic renovation, which is usually intended mainly to improve the energy economy of buildings. However, when new buildings are planned within range of a considerable noise source, extra acoustic insulation is often incorporated in provisions attached to detailed land-use plans.

Although financial incentives and disincentives are possible means of promoting noise abatement, their use has not been studied in detail in Finland.
In order to promote noise abatement in the future, it will be necessary to use public enlightenment and information measures more actively than is presently the case. Such measures should be focused both on those sources of noise whose activities are particularly important in relation to noise abatement and on ordinary citizens.

It has been said on numerous occasions that noise abatement is apparently the least developed sector of environmental protection in Finland. Scarcity of resources has meant that progress on the environmental protection front has been gradual and noise abatement has not been given enough attention. The underdevelopment of noise abatement is doubtlessly due to ignorance, and even disparagement of the problem. There has not been enough information about the noise situation and its development. However, awareness of how essential and urgent an effective noise-abatement policy is has been gradually growing. The 1981 report of the Committee appointed to study noise abatement, on which the Ministry of the Environment has since based its planning in this respect, is considered the first stage of this work. The enactment of legislation on noise abatement is seen as the most important means of achieving concrete results, because it would provide the prerequisites for appropriate planning and action against structural noise problems, especially those stemming from traffic. Only new legislation provides an effective means of implementing the OECD's recommendations in Finland.

22 ENVIRONMENTAL HEALTH

22.1 General

Environmental hygiene tends nowadays to be integrated with environmental protection since one of the most important tasks of environmental protection is to prevent health hazards. In the Nordic countries human health belongs explicitly to those interests which are to be safeguarded by environmental protection legislation and its implementation.

Environmental hygiene has the longest history of all sector of environmental protection, far longer than nature conservation which is sometimes considered "classical". Sanitary provisions seem to be as old as the art of writing. Rather substantial provisions already being in force in the Egypt of the Pharaohs and the Roman Empire.

Environmental hygiene was the responsibility of local government in mediaeval Europe. It gained a firm hold in Europe at the time the prevention of communicable diseases was being given a scientific dimension, i.e. in the 19th century. Work to improve maternity care and reduce infant mortality became an important sector of hygiene, i.e. preventive medicine. Microbiology played a key role in this development. The prevention of communicable diseases was based largely on improvements in food hygiene and housing and the use of vaccines.

The importance of environmental quality to environmental hygiene increases along with the reduction in infant and maternal mortality, incidence of communicable diseases, food (including drinking water) infection and microbiological food poisoning. The traditional problems of environmental health are increasingly replaced by environmental problems arising from water polluted by harmful substances, from indoor air pollution, from chemicals intentionally or unintentionally spread in the environment, and from noise.

Since microbiology and inspection of the most vulnerable foodstuffs, i.e. foods of animal origin (meat, milk, fish and other seafood, and eggs) have been the key issues in environmental hygiene, veterinary hygienists play a vital role in the environmental hygiene of the Nordic countries as Public Health Officers. The main duty of municipal Public Health Inspectors and municipal public health laboratories has also been food inspection. In the 1970s, however, environmental protection came to be understood in a broader sense. This caused problems with the municipal health authorities because the legislation on which their action and decisions have to be based, the Public Health Act, does not recognize environmental interests other than those pertaining more or less directly to human health. Thus they could not meet the expectations of "ecologically" desirable statements and decisions. Municipal environmental protection administration was therefore reformed, as described in chapter 8.6.3, despite the relatively good qualitative and quantitative resources of municipal health authorities and of their professional and formal competence.

Environmental medicine, which is the modern form of environmental hygiene and environmental health, is still quite new in Finland, particulary as a branch of human medicine. It has been important to veterinary

medicine for considerably longer. The Department of Environmental Hygiene and Toxicology was not established in the National Public Health Institute until 1982.

The environmental health situation is fairly good in Finland, although there is a shortage of epidemiological data (cf. chapter 18.1).

22.2 Organization

Environmental health has for the most part been the responsibility of local authorities, including Public Health Inspectors, veterinary hygienists and other veterinarians working as Public Health Officers, and municipal public health (food and environment) laboratories. Environmental health has not been a priority at the central government and provincial government level.

The organization of environmental health services is described in chapters 8.4 (paragraphs 1, 3 and 4), 8.5, 8.5.1 (paragraphs 1 and 11), 8.6.1 (paragraph 3) and 8.6.2 (paragraphs 1 and 2).

Food hygiene and control are a duty of the National Board of Health, the Veterinary Department of the Ministry of Agriculture and Forestry and the National Board of Trade and Consumer Interests subordinate to the Ministry of Trade and Industry. In the regional administration it is a duty of the Provincial Office and in the local government a duty of the municipal (or municipal joint authority) Health Board.

Drinking-water quality is regulated by the Public Health Act and Decree and controlled by the municipal public health authorities or laboratories authorized by the National Board of Health.

The municipal public health authorities have many other duties in environmental hygiene, such as the sanitary control of swimming-pools and bathing water, rearing of animals, supervision of cemeteries, waste management, sewerage and supervision of buildings, etc. From the environmental protection point of view their most important task is the approval of sites under the Public Health Act (see chapter 7).

Labour protection, including the supervision of the working environment, has its own public authorities (see chapter 8.4) in the State administration. The municipal Health Board is the local-government authority for labour protection.

Control of chemicals is dealt with in chapter 20.

22.3 Radiation protection

The Centre for Radiation and Nuclear Safety is the national authority responsible for the regulation of radiation protection and nuclear safety in Finland. It was established in 1958 to organize the regulation of medical and industrial uses of radiation in accordance with the Radiation Protection Act. At the end of the 1960s the Centre's field of activities was broadened to cover the siting, construction and operation of nuclear power plants in accordance with the Atomic Energy Act.

The statutory task of the Centre is to prevent and limit any harmful effects associated with the use of radiation and nuclear energy. Its principal activities as a national executive authority are

- to inspect, test and license equipment and establishments generating radiation or containing radioactive sources, to control the manufacture of and trade in such sources, and to supervise the medical, industrial and other uses of radiation;
- to regulate the design, construction, operation and decommissioning of nuclear power plants, including the control of nuclear materials and nuclear wastes;
- to survey the exposure of the population to natural ionizing radiation, to study the factors contributing to it and to issue recommendations concerning the remedial measures required;
- to monitor the radioactive contamination of the environment and to be prepared to intensify monitoring in the event of a nuclear disaster;
- to study the exposure to irradiation of occupational groups and the population at large as well as the effects of ionizing radiation on man;
- to carry out research related to radiation protection and reactor safety;
- to aid other authorities in emergency planning;
- to carry out training, information and publishing activities;
- to participate in international cooperation.

The Centre for Radiation and Nuclear Safety is under the administrative control of the Ministry of Social Affairs and Health, which is the highest authority in matters of radiation protection. Actions regulated by the Atomic Energy Act are under the jurisdiction of the Ministry of Trade and Industry. Civil defence precautions and contingency plans associated with nuclear fall-out and rescue services for nuclear power plants are administratively subordinate to the Ministry of the Interior. The Centre for Radiation and Nuclear Safety acts as a consultative body in these areas.

The permanent staff of the Centre numbers over 200, more than half of whom are university graduates or specialists in their own fields. About one third of the staff are engaged in research and development. The supervision of nuclear energy, including both technical control of nuclear safety and surveillance of the environment, accounts for roughly one half of the Centre's capacity. The main emphasis in R&D performed at the Centre is on monitoring radioactivity and studying the behaviour of radionuclides in the environment, on study of the extent to which occupational groups, patients and the population in general are exposed to ionizing radiation, and on investigating the biological effects of radiation. The Centre carries out training and information activities in the field of radiation protection.

The Centre is divided into four departments: the Department of General Administration, the Department of Nuclear Safety, the Department of Inspection and Metrology, the Surveillance Department and a separate Laboratory of Radiobiology. Although the Centre's activities cover the whole country, it has no regional organization. It does have a small research station in northern Finland for monitoring environmental radioactivity.

As the Centre is the national authority in the field of radiation protection and nuclear safety. It maintains close contacts with other national administrative bodies, institutes and research centres in Finland and works closely with them. Cooperation is also carried on at the international level with institutes and organizations in the same field, particularly with those in the other Nordic countries.

Importation, transport within Finland, manufacture, possession, sales and export of radioactive substances are allowed only upon issuance of a special Safety Licence. This Licence is also required for machines and equipment emitting radiation. The Licence is granted against a written request usually submitted by the Centre for Radiation and Nuclear Safety. The National Board of Health issues licences for substances and equipment intended for medical purposes, and the Ministry of Trade and Industry issues licences for substances and equipment specified in the Atomic Energy Act.

The radiation protection legislation is based mainly on the recommendations of the International Commission on Radiological Protection (ICRP). Recommendations and practical guidance have also been obtained from publications issued by the International Labour Organization (ILO), the World Health Organization (WHO) and by regional bodies such as Euratom and the Organization for Economic Co-operation and Development (OECD) and its Nuclear Energy Agency (NEA).

Radon in indoor air is responsible for about 55 per cent of the total radiation dose of man in Finland. An inexpensive solid state nuclear track dosimeter measuring long-time average concentrations has been developed by the Centre for Radiation and Nuclear Safety for the study of radon exposure in dwellings. The highest concentrations have been found in dwellings with direct contact to the ground. Several thousands of detached houses have been measured, the main objective being to find geographical differences and correlations with geological parameters. The experience thus attained can be used in classifying future building areas as to their radon criticality. The presence of radon in mines and in other workplaces is also monitored to control the workers' exposure to radiation.

Drinking water from some drilled wells can also contain natural radionuclides other than radon, and significant doses can be obtained in this way. Compared with radon measurements, analyses of these radionuclides are laborious and expensive, and they are performed only when necessary.

Besides studies on the exposure of man, source-specific studies relating to environmental monitoring and product control are also carried out by the Centre for Radiation and Nuclear Safety. They involve issues such as

the environmental effects of uranium prospecting and mining, emissions of natural radioactivity from power plants, the radiation properties of construction materials, and radioactivity in fertilizers.

IX INTERNATIONAL ACTIVITIES

23 INTERNATIONAL CO-OPERATION

23.1 General considerations

The emphasis in Finnish participation in international environmental cooperation is laid on the solution of global environmental problems including those of the developing countries and on the protection of the global commons. All these issues have both a direct and an indirect impact on the environment in Finland. Priority is given to issues which call for solutions most urgently and have a direct impact on our own environment.

The official governmental statements on environmental policy underline the interdependency of national and international measures. The programme declaration by Prime Minister Harri Holkeri's Cabinet on April 30, 1987 states: "The Future of our world depends both on our national measures and decisions, and on those in other parts of the world; they are continuously mirrored in the state of the environment. We must endeavour, in all fields, continuously to take into account both short- and long-range effects and consequences. The Government will promote the efforts to strengthen international cooperation within environmental protection." In this programme special reference is made to the prevention of transboundary air pollution and the depletion of the ozone layer.

In the Government's Report to Parliament on Environmental Protection in September, 1984 the following is stated: "Most of the dimensions of environmental policy are international - the Earth is one and indivisible. The principal goals of international co-operation in the field of environmental protection are the protection of global natural resources, such as the oceans and the atmosphere, and the solution of environmental problems in developing countries. Many pollution phenomena do not respect frontiers. Accordingly, the state and future of the environment in a country depends on the international development. The most serious environmental problems in the developing countries are desertification, destruction of forests, especially tropical forests, lack of clean drinking water, and the increase of slums and other marginal housing. A responsible environmental policy requires a rational use of natural resources in the developing countries and a just development of economic relations. Detente is conducive to this development. Curbing the arms race and work for disarmament are also actions against a wasteful use of human and natural resources and therefore contribute to environmental protection. Efforts to prevent nuclear war are most important from the viewpoint of environmental protection as well.

The implementation of programmes and conventions on environmental protection has to be intensified in the 1980s. Finland will play an active role in this work and intends to implement the principles and targets of international conventions in her legislation and environmental policy. Finland also participates in international environmental research projects and exchanges of information on environmental protection. An important target of international co-operation is to produce environmental norms

and standards and to ensure that they are observed. Bilateral co-operation is carried out with neighbouring countries as well as with the most important market-economy and socialist countries. Nordic co-operation and measures to protect the Baltic Sea will be made more efficient. Finland participates actively in the environmental cooperation of the ECE and the OECD. She pursues scientific and technical co-operation in the field of environmental protection with the Council for Mutual Economic Assistance (CMEA) and participates as an observer in the Council of Europe's work in the environmental protection sphere. The preconditions for work done by the UN, its specialized agencies and other bodies, such as UNEP, to solve environmental problems will be reinforced in accordance with Finland's UN policy. The Government will support the work of UNEP by contributing to the United Nations Environment Fund at proportionally the same level as the other Nordic countries and by implementing joint projects agreed within UNEP.

Several international bodies, such as the United Nations Environment Programme (UNEP), the World Bank, the OECD and the Nordic Council of Ministers have drawn urgent attention to the fact that environmental protection has not been adequately emphasized in development co-operation. The co-ordination of development co-operation and environmental protection is necessary both for these activities themselves and for the economic development of individual countries and of the world as a whole.

23.2 International documents concerning Finland

Since the beginning of the 1970s Finland has participated actively in the development of international environmental law both in international organizations and through bilateral arrangements. Finland has participated in the development of i.a. the following important international instruments of environmental policy:

- the Stockholm Declaration on the Environment, 1972;
- the Recommendations by the United Nations Conference on Human Environment held in Stockholm in 1972;
- the provisions on environment in the Final Act of the Conference on Security and Co-operation in Europe (CSCE), 1975;
- the Concluding Document of the Madrid Meeting of Representatives of the Participating States of the CSCE, 1983;
- the proceedings of the Symposium on Problems Relating to the Environment arranged by the United Nations Economic Commission for Europe (ECE), 1971;
- the decisions of the High-level Meeting on Environmental Protection held under the auspices of the ECE, 1979;
- the Declaration on Environmental Policy adopted by the Ministerial Level Meeting of the Environment Committee of the Organisation for Economic Co-operation and Development (OECD), 1974;
- the OECD Declaration on Anticipatory Environmental Policies, 1979;

- the World Conservation Strategy presented to governments in 1980 by the United Nations Environment Programme (UNEP), the International Union for Conservation of Nature and Natural Resources (IUCN) and the World Wildlife Fund (WWF);

- the Nairobi Declaration on the Environment adopted by the special session of UNEP, 1982;

- the Programme for Nordic Co-operation in Environmental Protection from 1983 to 1987 adopted by the Nordic Council of Ministers in 1983.

23.3 International environmental law concerning Finland

Finland is a contracting party to almost all major international and regional European conventions and agreements for environmental protection and nature conservation, such as

- the Convention concerning the use of White Lead in Painting, 1921;

- the International Convention for the Regulation of Whaling, 1936 (as amended in 1965);

- the International Convention for the Prevention of Pollution of the Sea by Oil, 1954 (as amended in 1962, 1969, 1971, 1974 and 1980);

- the Convention on the Continental Shelf, 1958;

- the Convention of Fishing and Conservation of the Living Resources of the High Seas, 1958;

- the Antarctic Treaty, 1959;

- the Convention concerning the Protection of Workers against Ionizing Radiations, 1960;

- the Convention on Third Party Liability in the Field of Nuclear Energy, 1960 (including the Additional Protocol of 1964);

- the Convention Supplementary to the Paris Convention of 1960 on Third Party Liability in the Field of Nuclear Energy, 1963 (as amended in 1964);

- the Treaty Banning Nuclear Weapon Tests in the Atmosphere, in Outer Space and under Water, 1963;

- the Convention for the International Council for the Exploration of the Sea, 1964 (as amended in 1970);

- the Treaty on Principles governing the Activities of States in the Exploration and Use of Outer Space including the Moon and other Celestial Bodies, 1967;

- the European Convention for the Protection of Animals during International Transport, 1968;
- the International Convention Relating to Intervention on the High Seas in the Cases of Oil Pollution Casualties, 1969;
- the Convention Relating to Civil Liability for Oil Pollution Damage, 1969 (including the protocol of 1976);
- the Convention on Wetlands of International Importance Especially as Waterfowl Habitat, 1971 (as amended in 1982);
- the Treaty on the Prohibition of the Emplacement of Nuclear Weapons and Other Weapons of Mass Destruction on the Sea-bed and the Ocean Floor and in the Subsoil thereof, 1971;
- the Treaty between Denmark, Finland, Norway and Sweden on co-operation of measures against Oil Pollution of the Sea, 1971;
- the International Convention on the Establishment of an International Fund for Compensation for Oil Pollution Damage, 1971 (including the Protocol of 1976), (as amended in 1976);
- the Convention concerning Protection against Hazards of Poisoning arising from Benzene, 1971;
- the Convention for the Prevention of Marine Pollution by Dumping from Ships and Aircraft, 1972 (as amended in 1981);
- the Convention on the Prohibition of the Development, Production and Stockpiling of Bacteriological (Biological) and Toxic Weapons, and on their Destruction, 1972;
- the Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972;
- the Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter, 1972 (as amended in 1978);
- the Convention on International Trade in Endangered Species of Wild Fauna and Flora, 1973 (as amended in 1979);
- the Convention on Fishing and Conservation of the Living Resources in the Baltic Sea and the Belts, 1973 (as amended in 1982);
- the International Convention for the Prevention of Pollution from Ships, 1973 (including the Protocol of 1978);
- the Protocol Relating to Intervention on the High Seas in Cases of Marine Pollution by Substances Other than Oil, 1973;
- the Convention on the Protection of the Environment between Denmark, Finland, Norway and Sweden (including a supplementary Protocol), 1974;

- the Convention on the Protection of the Marine Environment of the Baltic Sea Area, 1974 (as amended in 1980, 1981, 1983, 1984 and 1985);
- the Convention concerning Prevention and Control of Occupational Hazards caused by Carcinogenic Substances and Agents, 1974;
- the Convention on the Prohibition of Military or any Hostile Use of Environmental Modification Techniques, 1977;
- the Convention concerning the Protection of Workers against Occupational Hazards in the Working Environment due to Air Pollution, Noise and Vibration, 1977;
- the Convention on the Conservation of European Wildlife and Natural Habitats, 1979;
- the Convention on Long-range Transboundary Air Pollution, 1979;
- the Convention for the Conservation of Salmon in the North Atlantic Ocean, 1983;
- the International Tropical Timber Agreement, 1984;
- Protocol to the 1979 Convention on Long-range Transboundary Air Pollution on Long-term Financing of the Co-operative Programme for Monitoring and Evaluation on the Long-range Transmission of Air Pollutants in Europe (EMEP), 1984;
- the Vienna Convention for the Protection of the Ozone Layer, 1985;
- the Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes, 1985;

Finland has also signed or is making preparations for signing and ratifying the following conventions:

- the Convention on the Conservation of Migratory Species of Wild Animals, 1979;
- the United Nations Convention on the Law of the Sea, 1982.
- the Montreal Protocol on Substances that Deplete the Ozone Layer, 1987.

The amendments necessary for proper implementation of ratified conventions and protocols have been introduced into Finnish legislation. This has sometimes caused a delay in the ratification process. Also, insufficient human resources for the ratification process cause delay.

The Ministry of the Environment is responsible for supervising the enforcement of international environmental law in Finland.

23.4 Multinational co-operation at the global level within the framework of the United Nations organization system

23.4.1 United Nations Environment Programme, UNEP

The United Nations Environment Programme, UNEP provides a valuable forum for global environmental cooperation. Finland also participates actively in co-operation concerning the man-made environment within the United Nations Human Settlements Commission, UNHSC.

Although active, Finland has only taken initiatives in a selected number of environmental issues within UNEP. Moreover, she seldom makes statements criticizing the programme. Finland has preferred broad programmes to limited sectors and issues of environmental policy.
In the General Assembly, the Economic and Social Council and the United Nations Environment Programme (UNEP), the five Nordic countries work in close co-operation with each other and, as appropriate, with other like-minded countries (cf. 23.5.6). In this context emphasis has been put on

- the action of the UNEP as a co-ordinating and catalytic body;
- the analysis of global environmental problems and efforts to solve them;
- the environmental problems of developing countries;
- the prevention of harmful atmospheric changes;
- the protection of tropical forests;
- the prevention of desertification;
- the protection of the diversity of species;
- the protection of regional seas;

For the achievement of these goals the following supportive measures are important:

- the System-wide Medium-term Environment Programme (SWMTEP).
- the development of environmental law;
- the Global Environment Monitoring System (GEMS) and the International Referral System for Sources of Environmental Information (INFO-TERRA);
- the International Register of Potentially Toxic Chemicals (IRPTC);

- the regional activities of the UNEP, especially its co-operation with the regional Economic (or Economic and Social) Commissions.

Finland's contribution to the Environment Fund of the United Nations is 5 million FIM in 1988.

The general policy of Finland within the UNEP is seen in the statements made by her delegates and representatives. Her role in decision-making is progressive and constructive, as is reflected in the amount of Finland's contribution to the Environment Fund. However, despite an early support in principle for the clearing-house activities of UNEP, i.e. a special financing system aimed at the solution of the most serious and pressing environmental problems of developing countries, Finland's first concrete contribution to the clearing-house did not come until 1986, even though the first decisions by UNEP concerning this activity were made at the 10th session of its Governing Council in 1982. Finland has nominated an expert to assist UNEP's desertification control programme activities for two years starting in September 1986. A decision has also been made to nominate an expert for the Global Environmental Monitoring Programme (GEMS) and an Associate expert for the Cairo Action Plan of the African Environment Ministers.

Finland has actively participated in the formulation of international environmental law on the basis of the programme adopted for UNEP in Montevideo in 1981. Particular efforts have been devoted to the negotiation of the two instruments, the convention and the protocol, for the protection of the ozone layer. Finland has also participated in the development of a number of legal guidelines and principles such as the Montreal Guidelines for the Protection of the Marine Environment against Pollution from Land-based Sources of 1985, the Cairo Guidelines and Principles for Environmentally Sound Management of Hazardous Waste of 1987 as well as the Goals and Principles of Environmental Impact Assessment of 1987. A great interest and importance is at present attached to the drafting of a Convention on the Control of Transboundary Movements of Hazardous Waste now being initiated by UNEP. A number of other legal instruments might be found necessary in the field of environmental protection and nature conservation.

Finland also hosts and organizes UNEP expert meetings and seminars. E.g. an international seminar on environmental management in the pulp and paper industry for participants from developing countries was organized jointly by Finland and UNEP in 1986.

The co-ordinating and catalytic role of UNEP is hampered by many problems at both the national and the international level. Especially the Specialized Agencies of the United Nations tend to ignore or overlook this role of the UNEP, except as a source of financing, which was not originally intended to be UNEP's role. The same may be true of UNEP in that it does not make enough use of the experience and know-how of the Specialized Agencies when carrying out its projects. It is to a great extent the duty of the Member Governments to make efforts to eliminate such drawbacks by better co-ordination at the national level and by criticizing wrong practices in the decision-making bodies of the international organizations. The role played by Finland in this respect

has, however, been very modest and so far there have not been many efforts for co-ordination at the national level.

23.4.2 World Commission on Environment and Development (WCED)

Finland was one of the early supporters of the establishment of a special, independent Commission for considering the long-term perspectives of environment and development. Finland also contributed to the financing of the work of the Commission. Finland will in cooperation with other countries, in particular with the Nordic ones, promote the implementation of the recommendations of the WCED within the United Nations and other international organizations.

23.4.3 United Nations Economic Comission for Europe (ECE)

The ECE is considered as an important forum for East-West co-operation. This fact probably encourages Finland to participate actively in the work of the Senior Advisers to ECE Governments on Environmental Problems and Water Problems as well as the Housing, Building and Planning Committee. The same applies to the other Nordic countries. Issues given priority by Finland have been

- reduction of transboundary air pollution;
- low and non-waste technology (i.e. clean technology);
- water pollution control;
- environmental impact assessment;
- nature conservation.

In the opinion of Finland the most critical issues in the work of ECE in the field of the environment are - not surprisingly - the shortage of resources and the problems with co-ordination. The work of ECE tends to be rather sectorized; at the national level there are also co-ordination problems in the participation in the work of the ECE. A merger of the SAEP and the Committee on Water Problems is welcomed by Finland.

Finland also hosts and organizes ECE seminars and meetings and acts as a leading country in the priority areas of cooperation. In 1985 Finland hosted the 3rd Session of the Executive Body to the Convention on Long-range Transboundary Air Pollution. In this session 21 Member States signed the Protocol on Reduction of Sulphur Emissions or their Transboundary Fluxes by 30% by 1993 at the latest.

The Convention on Long-range Transboundary Air Pollution (1979) is a Nordic initiative and is based on a Nordic draft presented during the preparation of the High-level Meeting within the framework of the ECE on the Protection of the Environment, held in Geneva, 1979. The Nordic countries were also very active in the negotiations for the Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes. The most important contribution of Finland in particular to the preparation of the Convention and the Protocol may have been given in the form of legal drafting.

The necessary development of the co-operative programme for monitoring and evaluating of the long-range transmission of air pollutants in Europe (EMEP) was originally financed by voluntary contributions from some countries, including the Nordic ones. The background to the EMEP was to a significant extent an earlier programme of a similar nature carried out from 1972 to 1975 within the framework of the OECD by eleven countries, also including Denmark, Finland, Norway and Sweden.

After the signing of the Protocol on the Reduction of Sulphur Emissions or their Transboundary Fluxes the next step should, in the opinion of Finland, be the adoption of a protocol on control and reduction of nitrogen oxides emissions. The Nordic countries are actively working towards this goal, also bearing in mind the need for further reductions of sulphur emissions.

In August 1986 an ECE seminar was held in Finland on the protection of flora, fauna and their habitats. This is a new sector of cooperation and increased all- European activities in this field will be needed.

23.5 Other multilateral cooperation

23.5.1 The process of the Conference on Security and Co-operation in Europe (CSCE)

A considerable number of provisions in the Final Act of the CSCE is devoted to environmental issues. This is the result of the active role played by several countries, including the Nordic countries, in the preparatory work. The ECE features prominently in the implementation of these provisions of the Final Act. Environmental issues were also included in the Concluding Document of the Madrid Follow-up Meeting of the CSCE (1983), again as a result of the active role played by the Nordic and other countries.

A High-level Meeting for the Protection of the Environment was held in 1979 after intensive preparation. One of the objectives of the meeting initiated by the Nordic countries was that the meeting had to be able to produce at least one legally binding instrument. The outcome was the Convention on Long-range Transboundary Air Pollution (cf 23.4.3).

In the follow-up meeting of the CSCE in Vienna, several items concerning the environment are dealt with. Finland considers that a major political emphasis should be laid on concrete environmental issues in the SCE process.

23.5.2 Participation in the work of the Organization for Economic Co-operation and Development (OECD)

Finland has participated actively in environmental cooperation in OECD since 1971. After 1973, Finland has participated in almost all activities of the Environment Committee. The Finnish priorities are the following: Overcoming impediments to integration, Coastal zone management integration, Energy integration, Control of major air pollutants, Noise abatement, Chemicals data, Chemicals assessment, and Co-operative efforts on existing chemicals.

The implementation of OECD recommendations in the field of the environment is discussed separately in this report.

23.5.3 Co-operation in the European Free Trade Association (EFTA) and with the Commission of European Communities (CEC) and the Council for Mutual Economic Assistance (CMEA)

Finland will continue to participate in the recently initiated environmental activities of the EFTA, which will contribute to the internal coordination for cooperation between the EFTA and EC countries and the Commission of the EC.

In addition to cooperation between the EFTA and the EC Finland has established an exchange of information with the CEC. The representatives of Finland and the CEC meet annually to discuss matters of mutual interest. Issues of special interest have been air pollution control, the control of chemicals, the environmental impact of titanium dioxide production and the protection of the marine environment. The control of chemicals in Finland is quite similar in intent to that specified the directives of the European Communities.

Finland has participated and continues to do so in many European co-operation projects in the field of Scientific and Technical Research (COST). Subjects of cooperation are air pollution control and the utilization of sewage sludge.

The Council for Mutual Economic Assistance (CMEA) maintains relations with third countries and international organizations. Such relations between the Council and non-member countries are effected by inviting them to attend meetings of some CMEA bodies or in other forms. Since 1973 Finland and the CMEA have been developing their co-operation on matters of mutual interest on the basis of an agreement on economic and scientific-technical co-operation between Finland and the member countries of the CMEA. Multilateral co-operation in the field of environmental protection and improvement has been conducted within the framework of scientific-technological relations. Environmental co-operation started in 1974 in the following areas: the institutional framework of aspects of environmental protection, environmental education, air pollution control, water pollution control, waste management and nature conservation. The appropriate national bodies, organizations or enterprises in Finland and the CMEA member countries endeavour in their co-operation to arrive at joint agreements providing for concrete trade contacts and/or exchange of information. The co-operation has contributed to the development of waste management and low and non-waste technologies. Air pollution control, the problem of acid precipitation in particular, might provide a new field of interest in future co-operation.

23.5.4 Multilateral co-operation for the protection of the marine environment

Although every water pollution control measure today also affects the sea, the proper protection of coastal waters and the marine environment can only be achieved through international co-operation between coastal states. Such co-operation is essential in devising and coordinating national

management measures and developing procedures and techniques for mutual assistance. Multinational control inevitably results in better compliance with environmental objectives which also benefits areas beyond national jurisdiction.

Regional co-operation for the protection of the marine environment has proved to be the best and most cost-effective way of dealing with enclosed or semi-closed seas as well as with geographic areas covered by states with similar and/or mutually interdependent problems. Such co-operation, in which Finland, too, is actively involved, is carried out mainly within the framework of the International Council for the Exploration of the Sea (ICES), the Helsinki Commission, the Gdansk Convention and the Oslo Commission. However, many marine pollution problems also require a global approach and broader international action. For this reason, emphasis is given to the work of the Intergovernmental Maritime Organization (IMO), which has the task of increasing safety at sea and reducing the pollution of oceans by ships.

Finland is a party to the MARPOL Agreement of 1973 for the protection of the sea from vessel-based pollution, supplemented by a Protocol of 1978, as well as to a number of other global conventions referring to marine safety, pollution incidents at sea and liability for compensation.

Finland participated actively in the preparatory work of the 1982 UN Convention on the Law of the Sea. By signing the Convention, Finland has for her part acknowledged the importance of the Law of the Sea Convention in the assignment of specific responsibilities and the identification of specific environmental initiatives.

Importance is being increasingly attached to measures to improve the ability to combat oil spills and prevent the release of other dangerous chemicals at sea and to an efficient reduction of land-based pollution including air pollution of the sea.

Finland has long been concerned with the promotion and development of marine sciences and more recently with the protection of the marine environment and its living natural resources. The concern is reflected in the particularly long tradition of international co-operation in marine sciences in the whole Baltic Sea area.

Since 1902 the ICES has provided a forum for contacts between oceanographers of the Baltic and the North Atlantic. Finland has participated in the Council's activities from its inception. In addition, informal scientific communities such as the Conference of Baltic Oceanographers and Baltic Marine Biologists were established partly on the basis of a proposal by the Finnish Institute of Marine Research.

The Helsinki Convention of 1974 and the Gdansk Convention of 1973

Multilateral arrangements regarding the regulation of fishing had been made before the Second World War, but they where limited to certain states and concerned only certain species of fish. During the post-war period fishery experts and oceanographers repeatedly pointed to the urgency of joint intergovernmental measures but it was not possible until September 1973 to convene a diplomatic conference of all Baltic Sea States in Gdansk, Poland to adopt the Convention on Fishing and

Conservation of the Living Resources of the Baltic Sea and the Belts. The Convention was signed in 1974 and is now known as the "Gdansk Convention".

The issue of protecting the marine environment made swift progress in other areas as well. The Finnish initiative led to a series of meetings at which all Baltic Sea States were represented at the government-expert level. After intensive work a diplomatic conference was convened in Helsinki in March 1974. The conference unanimously adopted the draft Convention on the Protection of the Marine Environment of the Baltic Sea Area. The convention, which entered into force in 1980, is known as the Helsinki Convention. The Convention regulates all human activities likely to harm the marine environment.

Finland is currently giving priority to measures intended to diminish the eutrophication of the Baltic Sea. A recommendation concerning the reduction of phosphorus in municipal sewage is also of great importance, and the urgency of nitrogen removal from municipal waste water treatment should be investigated. The implications of the recommendation concerning the reduction of nutrient output from agriculture are emphasized.

In future work, priorities from the Finnish point of view are the effluents of the pulp and paper industry, the chemicals industry, and the metal industry and the impact of fish farming and forestry. The control of the dumping of dredged spoils is likely to become important. Other major sources of pollution such as air-borne pollution and radioactive releases have already been taken under consideration by the Helsinki Commission.

Other agreements involving the Baltic Sea Area

Before the conclusion of the Gdansk and Helsinki Conventions, Finland, Denmark, Norway and Sweden had adopted a treaty on co-operation of measures against Oil Pollution of the Sea in 1971. The Treaty aims to intensify the monitoring of oil discharges and to develop co-operation and mutual assistance between the contracting states. In addition to these and other forms for multilateral co-operation, the Baltic Sea States also maintain important bilateral contacts.

The Oslo Convention and the London Dumping Convention of 1972

Although the Oslo Convention (1971) applies to the North-East Atlantic and the North Sea, but not to the Baltic, Finland ratified the Convention in 1979. In the same year Finland also ratified the London Dumping Convention (1972) which applies to all seas. The main articles of both Conventions prohibit the dumping at sea of most toxic and persistent materials, unless they are present as trace contaminants or are rapidly rendered harmless by the action of the sea. However such dumping is subject to prior consultation under the Oslo Convention except as regards dredgings and sewage sludges. Under both Conventions prohibited substances may be dumped in emergency situations, after prior consultations, when there is no alternative method of treatment or storage on land. Wastes etc. may be dumped at sea only in accordance with a licence from the appropriate national authorities. The introduction of the Act and the Decree of 1979 on the Prevention of Marine Pollution enabled Finland to adopt the Oslo Convention and the London Convention.

According to the Act no activity which may result in the pollution of the high seas or the territorial waters of another state shall be carried out in Finnish territory, on the continental shelf which belongs to Finland, or on board a Finnish vessel.

The dumping of waste and other material is in general prohibited by the provisions of the Helsinki Convention. There are, however, two exceptions to this prohibition: dumping of dredged material subject to a prior special permit, and emergency dumping when the safety of human life is endangered or a vessel or aircraft is threatened by destruction or loss. All dumping areas of material dredged from water channels in Finland have been situated in internal waters except for one area, which is located in the sea area of Finland. If the dumping of waste is to take place outside Finnish territorial waters the permit must be considered by the Council of State. Since 1980 no such permits for dumping, including incineration, have been issued.

Finland has also taken active part in the work of the OECD Nuclear Energy Agency as far as development of the control of the dumping of radioactive materials is concerned. In accordance with a unanimous Nordic environmental protection policy, the dumping of any radioactive material should not be permitted. This policy has also clearly been voiced by the Nordic countries at the consultative meetings of the London Dumping Convention. Finland maintains that the disposal of radioactive material on land would be safer and also more readily supervised in the long run.

23.5.5 Environmental co-operation between the Nordic countries

The Nordic countries have a long record of active co-operation in the field of environmental protection, both bilaterally and, since the beginning of the 1970's, in the various bodies of the Nordic Council of Ministers.

During this period, the Nordic countries have made binding agreements on co-operation in the form of the revision of the Helsinki Agreement (the Agreement on Co-operation between Denmark, Finland, Iceland, Norway and Sweden, 1962) in 1974 and the Convention on the Protection of the Environment, which entered into force in 1976. Under the terms of these agreements, the countries co-operate both in the traditional abatement of pollution and in areas where preventive aspects play a more prominent role.

The Nordic Council

The Nordic Council provides a forum for co-operation between the Parliaments. It was founded by Denmark, Iceland, Norway and Sweden jointly in 1952. Finland became a member in 1955. The fundamental provisions of the Nordic Council are laid down in the Helsinki Agreement, signed in 1962 and revised in 1971 and 1974. The Council deals with questions concerning co-operation between the Nordic countries in the economic, legislative, social and cultural fields and regarding environmental protection and communications.

The Nordic Council has appointed five Standing Committees. Environmental issues are dealt with by the Committee for Social and Environmental Policy.

Each of the 78 elected members of the Council has the right to make proposals and so have the five Nordic Governments, jointly or separately. The proposals are discussed at Permanent Committees. On the proposal of the Committee, the Nordic Council then decides upon either a recommendation or a declaration of opinion to the Nordic Council of Ministers or to the Governments concerned. Reports on actions taken on the basis of the recommendations are to be submitted to a subsegnent session of the Nordic Council. Since 1972, a general report on Nordic co-operation has been delivered to the Nordic Council by the Nordic Council of Ministers. A number of permanent joint institutions and other permanent co-operative bodies also submit annual reports to the Council, thus making it possible for the Nordic Council to follow up recommendations previously adopted.

The Nordic Council of Ministers

The Nordic Council of Ministers (NCM) is a co-operative body of the Nordic Governments. The Council of Ministers was set up in 1971 by an amendment to the Helsinki Agreement.

The Council of Ministers can be composed of Ministers for Nordic Co-operation, or of Cabinet Ministers or of a combination of such Ministers. The Ministers for the Environment have been meeting as the Council of Ministers since 1974.

Decisions by the Council of Ministers are binding for the individual countries. Decisions on questions which, according to the Constitution of any of the countries, require the approval of the national Parliament, shall not be binding on that country until Parliament has approved the decision. The Council of Ministers is assisted in its activities by Committees of Senior Officials and by the Secretariat of the Council of Ministers in Copenhagen.

The Committee of Senior Officials for Environmental Protection prepares the programmes for co-operation in the field of environmental protection. The Committee is assisted by over 40 expert groups and working parties, dealing with all sectors of environmental protection. The first programme for co-operation in environmental protection covered the years 1972 to 1977, the second the years 1978 to 1982. During these years, the co-operation developed to cover a very broad field of environmental policy. On the basis of the experience gained from the two previous programmes, a third programme was prepared, covering the years 1983 to 1987.

The programme applies to Nordic co-operation in environmental protection within the Nordic Council of Ministers. The entire co-operation between the Nordic countries within the field of environmental protection is considerably more extensive.

The main objectives in the Third Programme for Nordic Co-operation in Environmental Protection can be outlined as follows:

The resources for research in the Nordic countries will be utilized more efficiently through the coordination of research plans and through joint reports. Methods of economic analysis to be used in

decision-making in the field of environmental protection will be developed in Nordic co-operation.

An investigation concerning the effects of polluting substances on the marine environment will be started.

Political decision-makers will be informed about the environmental impact of energy production so that necessary steps can be taken. The implementation of the working plan for Nordic energy co-operation will be followed to ensure that due attention is paid to environmental aspects.

Noise problems, which affect a considerable part of the population in the Nordic countries, will be prevented through planning and the introduction of stricter requirements for noise emission of 80 dB(A) for all types of vehicles. Furthermore, the study of the effects of noise on people will be continued.

The Nordic countries will co-operate in the field of recycling of wastes. Efforts will be made to remove obstacles to the trade in return (waste) materials, and better Nordic statistics on waste will be developed.

Efforts will be made to coordinate the system of classification and labelling of chemical substances and products between the Nordic countries and in wider international circles. Co-operation in the evaluation of the environmental and health effects and risks connected with chemical substances and products will be continued. Steps will be taken to allow for expanded exchange between countries of confidential information on these subjects.

Greater attention should be paid to nature conservation in connection with planning. The necessary tools for this will be developed and applied in Nordic co-operation. Through this and special measures, the preservation of endangered species of animals and plants and their natural habitats will be promoted.

A joint Nordic policy in the field of outdoor recreation will be put into effect. The pioneering work of the Nordic countries concerning the processing of environmental data will be continued nationally and on a Nordic basis.

The programme for monitoring the environment will be continued.

The policy of the Nordic countries as to global environmental and resource problems will be made more concrete and applied in relationships with developing countries, in connection with UNEP, internally in the Nordic countries, and in connection with co-operation with other industrialized countries.

In international connections the Nordic countries will harmonize their views on all areas of environmental work, and joint activities will be attempted whenever the prospects for further progress are good.

The Programme will be revised by the Council of Ministers in 1987 to refer to the period 1988-92.

The Nordic Committee of Senior Officials for Development Assistance Questions set up a Working Group in 1981 to deal with environmental issues in development assistance activities. The Working Group published a report, "Environment and Development Assistance" in 1984. The group is presently implementing the recommendations of the report.

The Nordic Convention on the Protection of the Environment

The Convention came about on the basis of an initiative by the Nordic Council. The Council of Ministers will continue to attach considerable importance to active political dialogue with the parliamentarians in the Nordic Council.

The Nordic countries are thus bound by the agreement to aim at a coordination of their environmental policy measures.

Furthermore, the Council of Ministers emphasizes that the Nordic countries, through the utilization of joint resources, can enhance the effectiveness of environmental protection efforts overall.

Nordforsk

Nordforsk is a joint Nordic non-governmental organization for co-operation in the field of technical and scientific research and development established in 1947. Members of Nordforsk are the National Technical Research Councils and Academies of Science and Technology as well as Technological Development Centres.

The main objective of Nordforsk in the field of environmental protection is to initiate joint development projects in pollution control and measurement techniques, to organize seminars and workshops dealing with the latest findings in environmental pollution control and to function as a service and information centre for research and development institutions, both public and private.

In recent years, the focus of Nordforsks's activities has been moving away from environmental issues towards more general R&D projects.

Other Nordic institutions

There are numerous other governmental and non-governmental Nordic organizations and institutions dealing with some aspect of environmental issues.

The Nordic Liaison Committee for Atomic Energy (NKA) has in recent years financed various surveys on environmental impacts from different energy sources.

The Nordic Council for Ecology is an organization for scientists, which arranges training courses and seminars on ecology and related sciences.

The Nordic Trade Unions and Industrial Associations have established their own Nordic Co-operation organizations dealing with, among other questions, the coordination of environmental policies.

23.5.6 Nature conservation organizations and conventions

In the field of nature conservation, Finland regularly participates in international co-operation within two organizations: the International Union for Conservation of Nature and Natural Resources (IUCN) and the Council of Europe. Additionally Finland is a party to four international conservation conventions.

Finland is a State Member of the IUCN. Also the principal non-governmental conservation organizations - the Finnish Association for Nature Protection, Natur och Miljö (the Swedish-speaking people's conservation organization) and the WWF Finland - are members of the IUCN. To co-ordinate the participation of the Finnish members with the various activities of the IUCN a special Working Group has been appointed by the Ministry of the Environment. Several persons participate independently in the work of IUCN's Commissions and specialist groups.

Although not a member of the Council of Europe, Finland has long actively participated in the conservation activities of the Council as an observer. In this respect, the work of the European Committee for the Conservation of Nature and Natural Resources and the European Information Centre for Nature Conservation have been of particular interest. Finland is a party to the Convention on the Conservation of European Wildlife and Habitats.

Finland joined the International Convention on the Regulation of Whaling in 1983 for the purpose of conserving whales. Accordingly, whaling is forbidden from Finnish ships, as is the import of whale products into Finland.

For the protection of species of wild animals and plants Finland has been a party to the Convention on International Trade in Endangered Species of Wild Fauna and Flora since 1975 and of the Convention on the Conservation of European Wildlife and Natural Habitats since early 1986.

To enhance the protection of a group of specialized habitats, Finland has been a party to the Convention on Wetlands of International Importance Especially as Waterfowl Habitat since 1971 and has nominated 11 sites for the list of the Convention.

A Finnish national association of the World Wildlife Fund was established in 1972 and it is supported by the patronage of the President of the Republic, Dr. Mauno Koivisto.

23.5.7 Other multilateral co-operation

International relations at the local level

All the central organizations of the Finnish municipalities, i.e. the Association of Finnish Cities, the Finnish Municipal Association and the Association of Finland's Swedish-speaking Municipalities, are members of the International Union of Local Authorities (IULA). They observe closely the activities of the Council of Europe in relation to local government. The Association of Finnish Cities also participates in the activities of the United Towns Organization (UTO). The bilateral contacts between local government organizations and between individual municipalities in various countries are close. Environmental issues are often dealt with in these contexts. In 1979 the IULA, the UTO and the Association of Finnish Cities organized a joint intermunicipal Baltic Sea protection conference.

International co-operation concerning standardization

The public authority generally responsible for standardization is the Ministry of Trade and Industry. Each Ministry is, however, responsible for standardization measures in its own sphere of competence. Finnish Standards with the emblem "SFS" are published by the Finnish Standards Association, which is the co-ordinating body for standardization in Finland and mainly responsible for international relations in the field of standardization. The main issues of environmental protection affected by standardization and the practice observed in them are as follows:

- water pollution control: the National Board of Waters is responsible for preparation of matters at the national level and for participation in Nordic co-operation (INSTA) relating to water quality. It represents Finland in the relevant Technical Committee of the International Organization for Standardization (ISO);

- air pollution control: a Working Group under the auspices of the Finnish Standards Association, financed partly by the Ministry of the Environment, is responsible for preparation of matters at the national level and for participation in the Nordic co-operation (INSTA) in air pollution control methods. It represents Finland in the relevant Technical Committee of the ISO;

- acoustics and noise: tasks similar to those of the previous sectors are carried out by the Technical Research Center and a Working Group under its auspices.

Participation in the activities of certain international organizations in the field of water and air management

The National Board of Waters participates in the activities of the International Association of Hydrological Sciences (IAHS).

The Water Association in Finland handles relations with the International Association on Water Pollution Researchand Control (IAWPRC).

The Finnish Air Pollution Prevention Society handles relations with the International Union of Air Pollution Prevention Associations (IUAPPA).

23.6 Bilateral co-operation

23.6.1 Bilateral co-operation with industrialized countries

Co-operation with the USSR

Finland and the Soviet Union made their first agreement on upkeep of the main channel of Lake Saimaa and on fishing in transfrontier waters back in 1922. At the same time agreement was also reached on floating timber in these waters. These agreements were re-enforced in 1948. An agreement was made and a Finnish-Soviet Commission on transfrontier watercourses established in 1964. Marine and continental-shelf boundaries in the area of the Gulf of Finland were agreed upon in 1965 and the corresponding continental-shelf boundary in the northeastern part of the Baltic Sea in 1967. Fishing and seal-hunting are regulated jointly by Finland and the Soviet Union on the basis of an agreement dating from 1969 (amended in 1973 and 1980). There are even further treaties regulating mutual use of the fishing zones of both countries.

In 1985 Finland and the Soviet Union concluded a Convention on Co-operation in Environmental Protection. Active co-operation in many sectors other than those concerning fishing and transfrontier watercourses got under way, however, a good twenty years ago. Joint Working Groups under the Joint Commission for Scientific-technical Co-operation have dealt with environmental issues involving the pulp and paper industry, the chemical industry, iron and steel and non-ferrous metallurgy, manufacturing of machines and equipment, water supply and sewerage, land reclamation and water management. Environmental protection, comprising waste management, air pollution control and nature conservation, was already a sector of its own in the long term (15-year) co-operation programme.

The new bilateral Convention on environmental protection has enabled a Mixed Commission to be established. The Commission is chaired by the Finnish Minister for the Environment and by the Chairman of the State Committee for Hydrometeorology and Control of the Natural Environment (GOSKOMGIDROMET). The first session of the Mixed Commission in April 1986 endorsed a work programme comprising issues of air pollution control, monitoring and protection of the Gulf of Finland, surface and ground water pollution control, clean technology, waste management, nature conservation and integrated monitoring of the state of the environment. Since the agreement on co-operation includes exchange of information and experts, joint research projects and anti-transboundary pollution measures, especially air pollution, its scope is wider than that of scientific-technical co-operation.

Co-operation with Sweden

The first agreement on fishing in the Tornionjoki and Muonionjoki rivers (the frontier rivers between Finland and Sweden) was concluded back in 1927. The Fishing Regulations for the Tornionjoki have been amended in 1933, 1960, 1966 and 1967. An agreement on the floating of timber in these rivers was made in 1949 and amended in 1964 and 1971. In 1971

an Agreement on Frontier Rivers was made and a Frontier River Commission established accordingly. The Commission is a joint authority for permit matters and supervision.

The boundary line on the continental shelf between Finland and Sweden is determined by an agreement dating from 1972. In 1975, agreement was reached on the rights of the fishermen of each country to fish in the fishing zone of the other country. Regions under national responsibility with respect to the implementation of the Convention on the Protection of the Marine Environment in the Baltic Sea Area were agreed upon in 1981. Since 1972 Finland and Sweden have been working together on the environmental problems of the Gulf of Bothnia. This activity has produced a number of studies which are also very useful for monitoring the state of the Baltic Sea.

Co-operation with Norway

Finland and Norway have concluded an agreement on fishing in the Tenojoki (Swedish and Norwegian: Tana) River in 1972 (amended in 1976, 1979 and 1982). In 1951 the two countries agreed upon channelling water from certain lakes in the Näätämöjoki (Norwegian: Neiden) watercourse into another watercourse. Fishing in the fishing area of the Näätämöjoki has been regulated by an agreement since 1977. A general bilateral agreement on fishing was made in 1976. In 1980 an agreement was concluded on the establishment of a Finnish-Norwegian Commission for transfrontier watercourses. The Commission's work programme lays its emphasis on environmental protection.

Co-operation with other countries

Environmental protection is part of scientific-technical co-operation with Czechoslovakia, the German Democratic Republic, Hungary and Poland. The main forms of co-operation are exchange of information and experts and joint symposia and meetings. With Hungary and GDR, general environmental problems, and water management, air pollution control, waste management and nature conservation have been dealt with. Matters dealt with in co-operation with Czechoslovakia and Poland have mostly concerned water management and to some extent air pollution control.

As part of cultural co-operation with France, problems of environmental protection, notably air pollution control, water management, waste management, nature conservation and protection of the built-up environment, are dealt with through the exchange of experts.

At the Ministerial level there have lately been contacts with all the countries mentioned above and with the Federal Republic of Germany, Switzerland, Austria, the United Kingdom and the USA.

23.6.2 Co-operation with developing countries

According to the Government Report to Parliament on Environmental Protection of 1984 it is Finland's aim "to promote environmental protection as a special sector of development co-operation in bilateral development co-operation programmes and to take environmental considerations into account in all major projects, particularly in the field

of agriculture and forestry, the forest industry, water supply and sewage as well as energy supply. Development co-operation projects directly or indirectly related to protecting and developing the environment will be implemented in the fields of water management, combatting desertification, soil protection, environmental administration and legislation, environmental research and physical planning and building."

On March 1, 1983 the Ministry for Foreign Affairs set up a Working Group with the task of elaborating a system for the consideration of environmental aspects in Finnish development co-operation and to function as an expert body at the various stages of development co-operation projects. In addition to representatives of the Ministry for Foreign Affairs, the Working Group consists of experts from the Ministry of the Environment, the Academy of Finland and relevant nature protection organizations. As a first stage in the implementation of its assignment the Working Group drew up a memorandum in 1984. On the basis of the recommendations included in the memorandum, environmental aspects could be taken into account systematically in the planning and implementation of development co-operation projects.

The principal recommendations by the Working Group are summarized in the following:

- the development co-operation carried out by Finland should be improved and further encouraged by paying more attention to nature conservation, environmental protection and the management of natural resources in the recipient countries;

- the direct and indirect environmental impacts of the development co-operation programmes and projects in the recipient countries should be studied to a sufficient degree before decisions related to the implementation of the programmes and projects are made. Special regard should be paid to monitoring the total impact of the programmes and projects as well as to monitoring after the implementation;

- environmental profiles giving general outlines of the natural resources, population and environmental conditions in the most important recipient countries should be drawn up from the viewpoint of the Finnish development co-operation. These profiles could be the basis for the planning of development co-operation as well as for decision-making. The environmental profiles could, as far as possible, be made in collaboration with the other Nordic countries;

- detailed baseline studies on the natural and environmental conditions should be carried out in order to increase the store of knowledge, which forms the basis of the planning and the decision-making in connection with the more comprehensive development co-operation programmes and projects;

- a thorough environmental assessment should be made when dealing with the development co-operation programmes and projects that, because of their contents or the environmental conditions in the recipient country, might cause substantial changes in the environment of the recipient country. When deciding whether thorough environmental

assessment is necessary, it is advisable to consult the OECD recommendations (ENV/EADA 84.4) where applicable;

- detailed guidelines related to the assessment of environmental impact of various kinds of development co-operation projects should be elaborated for the individual phases of the project preparations. In this elaboration the experiences of other countries and international organizations should be utilized and the work carried out in co-operation with the other Nordic countries;

- in the evaluation of the development co-operation programmes and projects more attention should be paid to environmental impact monitoring. When needed, special programmes should be elaborated for long-term monitoring of the environmental impacts of the projects;

- the Finnish development co-operation should more often include projects aimed at the protection, management and improvement of nature and the environment in the recipient countries;

- one of the endeavors of development co-operation should be the development of facilities for environmental protection at various administrative levels in the recipient country. One of the ways this could be done would be by stationing administrative experts in the offices and institutions of the recipient country. These experts could assist in the development of environmental legislation, enforcement of research facilities or establishment of environmental data systems;

- the Ministry for Foreign Affairs should draw up an educational programme for the consideration of environmental aspects in the developing countries. The instruction could be combined with the general training of development co-operation officials and civil servants;

- the civil servants, experts and researchers in the developing countries could be granted scholarships and other allowances for environmental studies and specialization in the field of environmental problems;

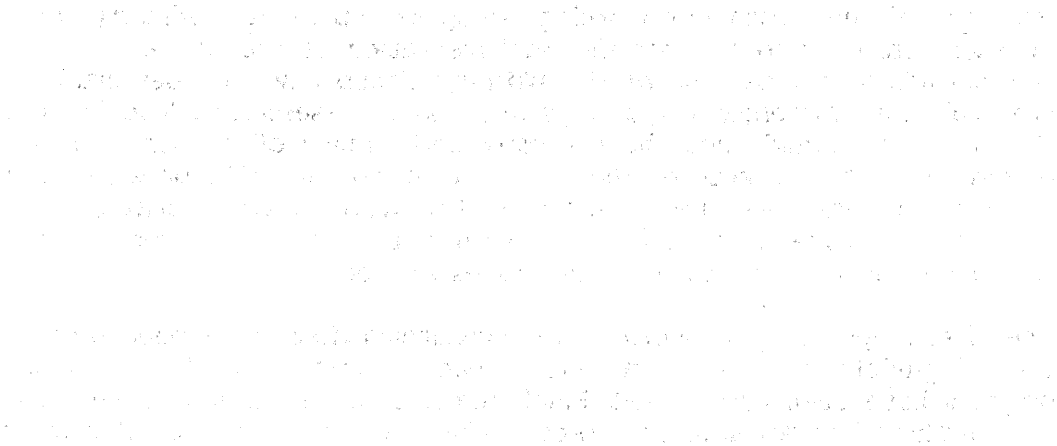
- the Ministry for Foreign Affairs should estimate the expert resources needed for the implementation of these recommendations and if necessary, reinforce its personnel in this field;

- when allocating the grants the Ministry for Foreign Affairs considers the implementation of the Working Group's recommendations by means of the existing allocation schemes or indicates a specific subsection in the scheme meant for environmental protection;

- Finland should play an active role in international co-operation in the management and protection of nature and the environment in developing countries. Finland should require international organizations to take environmental protection into account in their activities. Finland's contribution to the development co-operation and environmental co-operation carried out by UNEP and OECD should be reinforced. Finland, together with the other Nordic countries, could be a forerunner in studying and promoting environmental protection in the developing countries.

The task of the permanent Working Group set up by the Ministry for Foreign Affairs is to monitor the implementation of the above recommendations. The task of the Working Group also includes making proposals for environmental surveys and impact assessment. The Working Group takes a stand upon the necessity and volume of the assessment of environmental impacts of the development co-operation programmes and projects and supervises the assessment. The Working Group may also take the initiative in including the improvement of the environment in the development co-operation programmes and projects.

The first steps to implementing the recommendations have been taken. Special guidelines for environmental impact asessment of the development projects have been established. Much remains to be done, however. To date Finland has development co-operation projects with special bearing on environmental protection with Tanzania, Zambia, Kenya, Sri Lanka, Nepal, Vietnam and Cuba.



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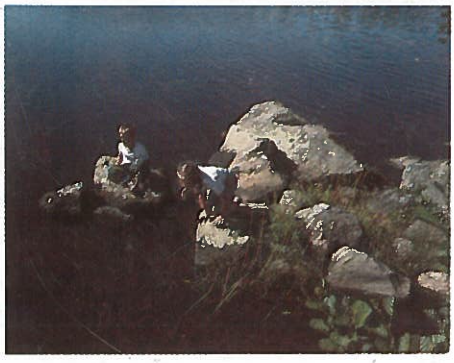

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